

Chemistry 5680  
Environmental Chemistry Laboratory  
Spring 2018

*Course Name:* Environmental Chemistry Laboratory

*Time/Location:* TH 2:30-5:20 p.m. ML-350 and various other laboratories.

*Instructor:* Stephen Bialkowski *Office* ML-359 *Phone:* 7-1907, email: [stephen.bialkowski@usu.edu](mailto:stephen.bialkowski@usu.edu)

*Office Hours:* During the laboratory, meeting by appointment or using email.

*Texts:* (not required) *Laboratory Experiments in Environmental Chemistry*, D. Neal Boehnke and R. Del Delumyea, Prentice Hall (2000). You should also have *Environmental Chemistry, 9<sup>th</sup> Edition*, Stanley Manahan, CRC Press, Boca Raton, since this is required for the CHEM 5670 associated lecture.

*Materials:* Bound laboratory notebook; safety goggles; laboratory coat (highly recommended); pencil, pen, calculator, etc.

*Course Content:* This course consists of about 8 laboratories. Laboratories include experiments in terrestrial, aquatic and atmospheric chemistry. Experiments will be selected from books and distributed to students prior to the experiments. Some *ad hoc* experiments will be performed as well. These will be performed in collaboration.

*Examinations:* Course performance will be evaluated based on 8 laboratory and project reports that are written using the data obtained during the laboratory session, calculations and supporting information, laboratory notebook and digital data integrity checks, and a short final quiz.

*Grading:* Each experiment has a maximum score of 10 points. The two laboratory notebook and data integrity checks will count 5 points each. The final quiz is 10 points.

Maximum Points	Task
60	6 Experiments
20	2 Projects
10	Laboratory notebook and data checks
10	Final quiz
<b>100</b>	<b>Total Points</b>

The maximum letter grade ranges will be: A, 90-100%; B, 80-89%; C, 70-79%; D, 60-69%. The ranges may be lowered but will not be raised. Plus (+) and minus (-) grade modifier will be used. The upper 1/3 of a letter grade % range will be assigned (+), the lower 1/3 will receive a (-) modifier.

*Laboratory Reports:* Laboratory reports are due one week after the laboratory is finished. The normal format is required. The reports will consist of the following sections:

- 1) Introduction: An explanation as to what is done and why it is important.
- 2) Experimental: A detailed description of how the measurements were taken, what reagents were used, and how the data was analyzed.
- 3) Results: Data analysis and conformance analysis. Questions regarding how the data fits the model and as well as accuracy and precision of the results should be answered here.
- 4) Discussion: A description of how the analyzed data fit or don't fit the models. Question of what the measurements mean to the environment are to be addressed here.
- 5) Conclusions: A short statement regarding what the results signify.
- 6) Bibliography: A list of any papers or books you used to understand the experiments, analyze the data, and used in the Discussion and Conclusion sections.

Reports are typically 6-10 pages and are typed (printed). Remember: data is useless if it is not communicated. The use of a computer to prepare the reports is recommended.

*Treatment of Experimental Data:* Statistical treatment of experimental data is very important in environmental chemistry. Much of this was addressed in the Chem 3000 lecture but it is good to review this all the same. I will hand out a copy of the section on statistical analysis on the A mini-lecture will be given on this as an aid to learning this important material.

*Scientific Computer Software:* Chapter III discusses the use of computer software for data collection and analysis. Of course we also use computers for preparing laboratory reports. Students will have the opportunity to work on spreadsheets and other scientific software with the TA or the professor

*Experiments:* This is a low enrollment course and students will work both alone and in groups. The group projects will include extensive sampling and data analysis. Some of the information will be collected online, accumulated and analyzed at the end of the semester. The department has the equipment for students to perform laboratories taken from the textbook. The following is a list of possible laboratories.

1. The pH and Buffer Capacity of Environmental Waters
2. Alkalinity of Streams and Lakes
3. Conductivity of Various Waters (TDS)
4. Fluorometric Determination of Polycyclic Aromatic Hydrocarbons
5. Determination of the Octanol/Water Partition Coefficient for Organic Pollutants of Varying Hydrophobic/Hydrophilic Character
6. Kinetics of the Decomposition of Pollutants in the Environment with an Application to Plasticizers
7. Introduction to Air Sampling: Particulates in Urban Air
8. Determination of the Concentration of Carbon Dioxide in the Atmosphere

We will discuss the possible group projects. I have several ideas in mind from monitoring seasonal variations of the water and air quality, through determining what anions are present in snow, to assessing the chemical composition of natural, agricultural and urban soils. Let's talk about what interests you.

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

*Missed Examination Policy:* Students may be excused from a laboratory in cases of emergency. Documentation must be supplied to be excused. In cases of excused absence, grades will be assigned based on % of adjusted total score. For other absences, late assignments will be penalized 10% of the maximum score per meeting day to a maximum of 50%. No repetition of experiments is permitted once a result is submitted.

*Attendance Policy:* Attendance is mandatory for successful performance in this course. Attendance is monitored through laboratory notebook checks.

*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.

*Laboratory Fee Statement:* A laboratory fee is required for this course. Laboratory fees for this course are used for the purchase of equipment and supplies for the laboratory.

*Assessment Statement:* The purpose of the physical chemistry laboratory is to learn laboratory procedures to measure physical properties of chemicals and to interpret these measurements with the theories describing the phenomena. Laboratory learning objective performance is evaluated through the formal written reports describing the experiments and data analysis.

*Learning Objectives:*

- Understand laboratory and chemical safety
- Comprehend concept of and perform chemical measurement calibration
- Relate the microscopic and macroscopic properties of matter to each other
- Use statistical methods for evaluating and interpreting data
- Assess sources of error in chemical and instrumental analysis and account for errors in data analysis
- Demonstrate competency in written and oral communication using mathematics if needed
- Comprehend the importance of stoichiometry, chemical equilibrium and kinetics
- Apply thermodynamic, kinetic and quantum methods in an integrated way in all areas of chemistry and biochemistry