

Lewis & Clark College
Perspectives in Environmental Chemistry, Chem100

Basic Information

Professor: Barb Balko; Olin 225; x 7534; balko@lclark.edu

Department Secretary: Amy Timmins; Olin 226A; x 7530; timmins@lclark.edu

Office Hours (tentative): Monday 10 – 11 am; Tuesday 3 – 4 pm; Wednesday 10 – 11 am; Thursday 1 – 2 pm; Friday 10 – 11 am. If there are changes to these hours, I will announce them in class, via an email, and on Moodle. Please keep in mind that I am happy to schedule appointments outside of my posted hours if you can't make the scheduled hours.

Lectures: MWF 11:30 – 12:30, Howard 244

Moodle: Enrollment key = CHEM100

Help Center: Monday 6 – 8:30 pm; Tuesday 3 – 5 pm, 6 – 8:30 pm, Wednesday 3 – 5 pm, 6 – 9 pm, Thursday 3 – 5 pm, 6 – 9 pm, Friday 11:30 – 1 pm. The center (SQRC) is located in Howard (former lounge in the first floor) along with the Math and Physics help centers.

Labs: You must register for a laboratory section as well as the lecture. Labs will meet approximately every other week **beginning the second week of classes (Jan. 27/28)**. For lab, please bring a lab notebook (a bound composition notebook) and your lab manual. You may want to bring your own safety goggles (available in the college bookstore); lab goggles will be available for your use in lab. Be sure to dress appropriately (closed-toe shoes, long pants or skirt, and a shirt that covers your midriff).

Required Materials

Text: *Chemistry in Context*, 7th edition

Lab Manual: *Chemistry in Context Laboratory Manual*, 7th edition

Safety Goggles: These must be worn **at all times** in the laboratory. Goggles will be available for you to use but you may want to purchase your own (available in the college bookstore).

Laboratory Notebook: This is a bound composition notebook

Calculator: This must have log and exponential capabilities.

General Information

My goal for this class is to provide you with basic principles of chemistry and have you apply these to current environmental issues such as climate change, ozone depletion, ocean acidification, and nuclear power in order to better understand them. I expect that by the end of the course you will appreciate the complexity of the environmental issues we discuss.

This class satisfies the scientific and quantitative reasoning general education requirement as a category A (laboratory) or category B (mathematical and quantitative reasoning: sciences)

course. Students interested in majoring in chemistry, biology, or physics should take the Chem110/120 sequence. Note that credit for Chem100 does *not* (currently) contribute to the environmental studies major.

To understand the environmental issues covered in this course, you will be expected to acquire a basic knowledge of chemistry (no prior background in chemistry is assumed). To do so, it is important to keep up with the reading, come to class, and do the homework. You are encouraged ask questions in class and during my office hours!

Student Learning Outcomes

By the end of this course, students will be able to:

1. Write, interpret, and understand equations for various types of chemical reactions (e.g., combustion, acid-base, nuclear fission, oxidation-reduction, polymerization).
2. Calculate and understand the significance of concentrations in gaseous and aqueous systems.
3. Understand atomic structure and the atomic basis for the periodic table.
4. Understand molecular structure. Specifically, be able to predict the formulas for ionic compounds and predict the type of bonds that form and the three-dimensional structure in simple covalent molecules.
5. Understand the interaction of matter and light and the environmental implications.
6. Calculate the energy change associated with various types of chemical and nuclear reactions and understand the environmental relevance of these numbers.
7. Understand the unique properties of water and use this to predict the solubility of various compounds.
8. Calculate the pH of a solution and understand the environmental implications of solutions with high and low pH's
9. Understand the types, risks, and sources of nuclear radiation.
10. Discuss key environmental issues (e.g., air pollution, climate change, ocean acidification, alternative fuels) in terms of basic chemical principles.
11. Critically evaluate graphical and tabular data.
12. Apply the scientific method to their own experiments, be proficient in fundamental laboratory techniques, be able to record relevant laboratory data and observations, be able to analyze their experimental results, and be able to accurately summarize and convey these results to others.

Course Strategy

Reading the text (skim it before the lecture and then read it thoroughly after the lecture), doing all the assigned homework, and coming to class are essential for succeeding in this course. Doing extra problems is especially helpful. I encourage you to form study groups and can suggest problems to work on in these groups. Don't be afraid to ask questions—there are no stupid questions and I guarantee that someone else has the same questions. In addition to

helping you, your questions will help me by making me aware of difficulties that the class is having with the material. Don't hesitate to see me if you're having difficulties!

Lectures

It is important to read your textbook before coming to class or at least skim it over to get a sense what we will be covering. Use the syllabus to find out what will be covered in lecture and read ahead. After class read the chapter and try some of the problems to practice what you learned that day. If you don't understand something, ask questions during lecture or come see me after class or during my office hours.

Office Hours

If you have questions that cannot be answered in class, would like additional practice problems, would like to talk about the class, or would like to talk about chemistry in general, please see me during my office hours. If the posted times don't work for you, feel free to make an appointment for another time.

Laboratory

Lab is an integral part of the course. This is when you get to put into practice what you've been learning. **Plan on attending all your labs as there are no make-ups.** Scheduling conflicts due to athletics or illness must be worked out with your instructor as soon as possible, preferably before the lab that will be missed. Read the lab before you arrive! Doing so will likely give you greater experimental success and help you to finish faster. **In order to pass the course, you must pass the laboratory section of the class!**

Moodle

The class moodle page will feature copies of assignments, solutions to homework problems and practice tests. There will also be links to other sites that you may find interesting as well as class announcements. To access our course Moodle page directly, go to <http://moodle.lclark.edu>. You'll be prompted to login to Moodle - use your L&C login and password (same as for email). Scroll down in the list until you find the chemistry department, click this link and then click on our course/section. The enrollment key is CHEM100. Remember, enrollment keys are case sensitive. Please let me know if you have any difficulty accessing the page.

Academic Honesty

I expect academic honesty. This means homework, labs, and exams should be your own efforts. Discussion about homework assignments and labs is encouraged but the work you turn in should be your own (i.e., it should be in your own words and you should be able to explain it fully if asked). Cheating will result in failure on the assignment, possible failure of the course, and disciplinary action by the College Honor Board. Please consult the *Pathfinder* for more information on the College's academic integrity policy. If you are having problems come see me!

Classroom Disruption

I expect the classroom and laboratory to be a comfortable environment for learning and that we support each other as we cover the basics of chemistry and discuss environmental issues. Thus, disruptive class or laboratory behavior, which is behavior that in my judgment impedes another student's opportunity to learn or interferes with the class goals, is unacceptable. Should such behavior occur, the student will be asked to leave class and I will refer the matter to the director of Academic Advising. Permission to return to class will be granted only after the student meets

with the director of Academic Advising and agrees to stop the disruptive behavior. If the disruptive behavior continues, the student will be dropped from the course.

Academic Accommodations

If you have a disability that may impact your academic performance, you may request accommodations by submitting documentation to the Student Support Services Office in Albany Quadrangle (x7191). That office will notify me of the accommodations for which you are eligible.

Grading

Two Midterm Exams	30%
Final	20%
Assignments	15%
Project	15%
Laboratory	20%

Midterm Exams

Two midterms will be given in class. The dates for these tests are in the syllabus.

Final Exam

The final exam is scheduled for Wednesday, May 7, 1 – 4 pm.

Assignments

Problems, written responses, discussion preparations, internet research projects, and other types of assignments will be assigned each week. Late assignments will be accepted but with a penalty: -2.5% for 1 day late, -5% for 2 days late, -10% for 1 week late, and -25% for later than 1 week.

Project

Students will work in groups of two or three to prepare a lesson plan that will teach elementary school students about an environmental topic of your choice. I'd like you to get creative with this assignment and use lots of visuals and activities: do a demonstration, use worksheets, etc. The *Journal of Chemical Education* is a good source for ideas. Lesson plans will be presented during the last two classes of the semesters. I will provide more details about the project expectations during the semester but start thinking about topics.

Laboratory

Labs will start the week of January 27 and will be held every other week (see the class schedule). The lab grade will be based on participation, the analysis of data, and questions turned in after the lab. Late lab reports will be accepted but with a penalty: -2.5% for 1 day late, -5% for 2 days late, -10% for 1 week late, and -25% for later than 1 week.

In order to pass the course, you must pass the laboratory section of the class!

Tentative Class Schedule

Date	Material	Reading	Lab
Wed., Jan. 22	Air Composition	1.1 – 1.2	
Fri., Jan. 24	Air Quality, Risk	1.3 – 1.5	
Mon., Jan. 27	Atoms, Molecules, & Reactions	1.6 – 1.10	Exp 1: What Am I Breathing?
Wed., Jan. 29	Air Pollutants	1.11 – 1.14	
Fri., Jan 31	Atomic and Molecular Structure	2.1 – 2.3	
Mon., Feb. 3	Molecular Structure, Continued	2.3	
Wed., Feb. 5	Light and Matter	2.4 – 2.7	
Fri., Feb. 7	Ozone destruction	2.8 – 2.9	
Mon., Feb.10	Ozone hole – global response	2.10 – 2.12	Exp 4: What Protects Us From UV light?
Wed., Feb. 12	Greenhouse Effect	3.1 – 3.2	
Fri., Feb. 14	Molecular Shapes, Vibrating Molecules	3.3 – 3.4	
Mon., Feb.17	Carbon Cycle, Moles	3.5 – 3.7	
Wed., Feb. 19	Climate Models	3.8 – 3.11	
Fri., Feb. 21	Energy	4.1 – 4.2	
Mon., Feb. 24	Energy from Hydrocarbon Combustion	4.3 – 4.4	Exp 7: How Can We Measure the Mass of a Molecule? Exp 8: How Do Chemical Equations Connect Compounds?
Wed., Feb. 26	Measuring Energy Changes	4.5 – 4.6	
Fri., Feb. 28	Test 1 (Chapters 1 – 3)		
Mon., March 3	Gasoline	4.7 – 4.8	

Wed., March 5	Alternative Fuels	4.9 – 4.11	
Fri., March 7	Water	5.1 – 5.4	
Mon., March 10	Aqueous Solutions	5.5 – 5.6	Exp 10: Which Fuels Provide the Most Heat?
Wed., March 12	Ionic versus Covalent Compounds	5.7 – 5.9	
Fri., March 14	Protecting Drinking Water	5.10 – 5.12	
Mon., March 17	Acids and Bases	6.1 – 6.4	
Wed., March 19	Ocean Acidification and Acid Rain	6.5 – 6.6	
Fri., March 21	SO ₂ and NO ₂	6.7 – 6.10	
Spring Break: March 24 – March 28			
Mon., March 31	Damage from Acid Rain and Acidification	6.11 – 6.14	Exp 17: Does Acid Reign? Exp. 18: Which Common Materials are Acids or Bases?
Wed., April 2	Energy from Nuclear Fission and Nuclear Reactions	7.1 – 7.3	
Fri., April 4	Radioactivity	7.4 – 7.6	
Mon., April 7	Nuclear Half-Life and Nuclear Waste	7.8 – 7.9	
Wed., April 9	Test 2 (Chapters 4 – 6)		
Fri., April 11	Risks-Benefit Analysis of Nuclear Power	7.7, 7.10 – 7.11	
Mon., April 14	Battery Basics	8.1 – 8.3	Exp 22: Can We Get Electricity from Chemical Reactions?
Wed., April 16	Hybrid Vehicles, Hydrogen Fuel Cells	8.4 – 8.6	
Fri., April 18	Photovoltaic Cells	8.7	
Mon., April 21	Other Sources of Electricity	8.8	

Wed., April 23	Polymer Structure and Formation	9.1 – 9.2	
Fri., April 25	Types of Plastics	9.3 – 9.4	
Mon., April 28	Recycling + Presentations	9.7 – 9.8	Exp 23: How Do Polymer Properties Connect to Structure?
Wed., April 30	Review + Presentations		

The final exam is scheduled for Wednesday, May 7, 1 – 4 pm.