CHEMISTRY 100 | Perspectives in Environmental Chemistry | Spring 2016

Instructor: Julio de Paula, Professor of Chemistry, Lewis & Clark College
Office: Olin 219 **Phone:** x7705 **Email:** jdepaula@lclark.edu
Office hours: Mondays 1-2 pm, Wednesdays 3-4 pm, Thursdays 11 am – noon, Fridays 4-5 pm
Lecture meeting times and room: Mondays, Wednesdays, Fridays 11:30 am – 12:30 pm, BoDine 300
Laboratory meeting time and room: Thursdays 1:20 pm – 4:20 pm, Olin 215
Course site: https://sites.google.com/a/lclark.edu/jdepaula/chem100

Course materials

Required text: Middlecamp et al., *Chemistry in Context: Applying Chemistry to Society, 8th Edition* (ISBN-13: 978-0-07-352297-5). This text is available from the college bookstore. A copy is also on reserve at Watzek Library.
Additional reading: On occasion I will refer to material on reserve at Watzek Library.
Safety goggles: Goggles 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: Your calculator must handle calculations involving logarithms and exponentials.

General information

This course satisfies the scientific and quantitative reasoning general education requirement as a category A (laboratory) or category B (mathematical and quantitative reasoning: sciences) course. It can also be used to satisfy the 'breadth course' requirement in the Environmental Studies major. Students interested in majoring in Chemistry, Biology, or Physics should take the CHEM 110/120 sequence.

Learning objectives

This course will explore basic principles of chemistry and their applications to current environmental issues, such as climate change, traditional and alternative energy sources, and ocean acidification. By the end of the course you should appreciate the complexity of the environmental issues we have discussed. Throughout the course you will be asked to:

- Understand the interaction between matter and light and its environmental implications.
- Understand atomic structure and the periodic table.
- Understand molecular structure.
- Write, interpret, and understand equations for various types of chemical reactions.
- Calculate and understand the significance of concentrations in gaseous and aqueous systems.
- Calculate the energy change associated with various types of chemical and nuclear reactions, and understand the environmental relevance of these quantities.
- Understand the types, risks, and sources of traditional and alternative energy technologies.
- Understand the unique properties of water, and use them to predict the solubility of various compounds.
- Understand properties of acids and bases, and apply them to environmental problems.
- Discuss key environmental issues (e.g., air pollution, climate change, ocean acidification, alternative fuels) in terms of basic chemical principles.
- Critically evaluate graphical and tabular data.
- 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 experimental results, and be able to summarize and convey these results to others.

Classroom activities

General strategy. Reading the text, doing all the assigned homework, engaging fully in classroom and laboratory activities, and preparing well for exams are essential for success in this course. Going beyond assigned work by

attempting additional exercises and problems is also very helpful. I encourage, and will sometimes require, that you work in groups. Lastly, please ask questions in class or during office hours.

Course site. A web site for this course has been created at https://sites.google.com/a/lclark.edu/jdepaula/chem100. It will be a repository of course documents (such as assignments, solutions to assigned exercises and problems, the laboratory manual), and a platform for collaboration among all of us.

Laboratory. Laboratory activities are integral to the course. In the laboratory you will put into practice what you will learn in the lectures. **Plan on attending every scheduled laboratory period as there are no make-up periods**.

This course has a single laboratory section that meets weekly, **beginning the second week of classes (Thursday, January 28).** To be ready to conduct an experiment you must have on hand a laboratory notebook (a bound composition notebook), a calculator, and appropriate laboratory handouts. Read the laboratory handouts before you arrive. Doing so will likely increase your chances of completing the experiment successfully and in a timely fashion. You must also wear safety goggles and be dressed appropriately (closed-toe shoes, long pants or skirt, and a shirt that covers your midriff). See the course website for details.

Festival of Scholars. The Festival of Scholars is a campus-wide celebration of student work. It is an opportunity to discuss research, to exhibit, perform, or appreciate art, and to cross disciplinary boundaries. The Festival will be held on Friday, **April 15, 2016**. Classes will be cancelled on that day, but you are still required to participate in the Festival, either by presenting your work or attending presentations by your fellow students. When the final program for the Festival becomes available, I will recommend attendance of specific presentations, and will explain how attendance will contribute to your course grade.

Grading. Two one-hour exams will be given in class, as in the updated schedule. Your final exam is scheduled for **Wednesday, May 4, 1-4 pm**. PLEASE DO NOT SCHEDULE TRAVEL THAT WOULD TAKE YOU AWAY FROM CAMPUS ON THIS DATE.

Your performance on in-class workshops will be graded; see the course website for details. A special project associated with the Festival of Scholars will be assigned and graded; see the course website for details, when they become available.

Your laboratory activities will be graded. See the laboratory page of the course website for details, but in general your laboratory grade will be based on participation, the care with which you gathered and recorded data, and the analysis and discussion of data in laboratory reports. Please note that **in order to pass the course you must pass the laboratory portion**.

Your final course grade will be calculated according to the following allocations:

Hour exams 30%
Final exam 20%
Workshops 25%
Project 5%
Laboratory 20%

Numerical grades translate to letter grades as follows:

A range: A = 93-100, A- = 90-92
B range: B+ = 87-89, B = 83-86, B- = 80-82
C range: C+ = 77-79, C = 73-76, C- = 70-72
D and F ranges: D+ = 65-69, D = 63-64, F = 62 or below

Academic integrity. I expect academic honesty, meaning that assignments and exams should be your own efforts or the efforts of the group tasked to do the work. Discussion about assignments is encouraged, and sometimes required, but

the work you turn in should be your own. That is, you should write in your own words, and you should be able to explain the work fully if asked. Work turned in by a group should be the work of only that group. Cheating will result in one or more of the following sanctions: a grade of F for the assignment, a grade of F for the course, or disciplinary action by the College Honor Board. Please review the College's Academic Integrity Policy. If in doubt, ask me first before proceeding in a way that may prove to be in violation of the policy.

Lateness policy. This policy applies to all graded work in this course. The maximum possible grade can only be given to an assignment that is delivered to the instructor by the pre-determined due date and time. An amount corresponding to 10% of the maximum possible grade will be deducted from the total grade of an assignment that is late by up to 24 hours. For every additional 24 hours of lateness, additional 10% deductions will be applied. Extensions will be granted only if warranted by extraordinary circumstances, as judged by the instructor. If you are involved in athletic or other extra-curricular activities that carry a fair number of deadlines, budget your time carefully, so all your commitments can be met satisfactorily. Please notify the instructor of potential conflicts well in advance of the extra-curricular event. Without proper notification, extensions on account of conflicts between extra-curricular and academic events will not be considered.

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 (x7156). After you have submitted documentation and filled out paperwork for the current semester requesting accommodations, staff in that office will notify me of the accommodations for which you are eligible.

Schedule of activities

This is the schedule as of January 18, 2016. Numbers in parentheses correspond to sections in *Chemistry in Context.* The course web site contains the updated schedule.

Theme	Week	Monday (lecture)	Wednesday (lecture)	Thursday (laboratory)	Friday (lecture)
Earth	1	**Jan 18** ***MLK Day*** (*no class*)	**Jan 20** Overview of the course; Matter and energy *(1.6, 2.4-2.5, supplementary material)*	**Jan 21** ***Laboratory does not meet this week***	**Jan 22** Matter and energy *(1.6, 2.4-2.5, supplementary material)*
	2	**Jan 25** Atomic structure and periodicity *(1.7, 2.2)*	**Jan 27** Atomic structure and periodicity (*1.7, 2.2)*	**Jan 28** Expt 1 - Spectroscopy of the Sun	**Jan 29** ***Workshop 1***
	3	**Feb 1** Molecules *(1.7-1.8, 2.3, 3.3)*	**Feb 3** Molecules *(1.7-1.8, 2.3, 3.3)*	**Feb 4** Expt 2 - Strategies for environmental remediation 1	**Feb 5** ***Workshop 2***
	4	**Feb 8** Chemical change *(1.9, 3.6-3.7)*	**Feb 10** Chemical change *(1.9, 3.6-3.7)*	**Feb 11** Expt 2 - Strategies for environmental remediation 2	**Feb 12** Chemical change *(1.9, 3.6-3.7)*
	5	**Feb 15** The Earth's crust *(supplementary material)*	**Feb 17** The Earth's crust *(supplementary material)*	**Feb 18** Discussion (Expts 1, 2)	**Feb 19** ***Workshop 3***
Wind	6	**Feb 22** The troposphere *(1.1-1.5, 1.10-1.14)*	**Feb 24** The troposphere *(1.1-1.5, 1.10-1.14)*	**Feb 25** Expt 3 - The air we breathe	**Feb 26** ***Exam 1***
	7	**Feb 29** The stratosphere *(2.1, 2.6-2.13)*	**Mar 2** The stratosphere *(2.1, 2.6-2.13)*	**Mar 3** Expt 4 - Greenhouse gases 1	**Mar 4** The stratosphere *(2.1, 2.6-2.13)*
	8	**Mar 7** Climate *(3.1-3.5, 3.8-3.11)*	**Mar 9** Climate *(3.1-3.5, 3.8-3.11)*	**Mar 10** Expt 4 - Greenhouse gases 2	**Mar 11** ***Workshop 4***
Fire	9	**Mar 14** Fossil fuels *(4.1-4.11)*	**Mar 16** Fossil fuels *(4.1-4.11)*	**Mar 17** Discussion (Expts 3, 4)	**Mar 18** Fossil fuels *(4.1-4.11)*
	10	***Spring break*** (*no classes*)			
	11	**Mar 28** Nuclear energy *(7.1-7.11)*	**Mar 30** Nuclear energy *(7.1-7.11)*	**Mar 31** Expt 5 - Solar cells; Expt 6 - Biodiesel 1	**Apr 1** ***Workshop 5***
	12	**Apr 4** Renewable energy *(8.1-8.8)*	**Apr 6** Renewable energy *(8.1-8.8)*	**Apr 7** Expt 6 - Biodiesel 2	**Apr 8** ***Exam 2***
Water	13	**Apr 11** What is water? *(5.1-5.2, 5.5-5.7, 5.9, 6.1-6.4)*	**Apr 13** What is water? *(5.1-5.2, 5.5-5.7, 5.9, 6.1-6.4)*	**Apr 14** Discussion (Expts 5, 6)	**Apr 15** ***Festival of Scholars*** *(activities will be announced)*
	14	**Apr 18** What is water? *(5.1-5.2, 5.5-5.7, 5.9, 6.1-6.4)*	**Apr 20** What is in water? *(5.3-5.4, 5.8, 5.10-5.11)*	**Apr 21** Expt 7 - Water hardness	**Apr 22** ***Workshop 6***
	15	**Apr 25** The oceans *(6.5-6.13)*	**Apr 27** The oceans *(6.5-6.13)*	**Apr 28** Discussion (Expt 7)	**April 30** ***Reading day*** (*no class*)