SDSU | San Diego State University

CHEM 571: TOPICS IN ENVIRONMENTAL CHEMISTRY

DATES: SECOND SUMMER SESSION 2023 (JULY 5TH THROUGH AUGUST 14)

COURSE INFORMATION

Instructor: Professor John Love
Department: Chemistry and Biochemistry
Email: jlove@sdsu.edu
Class Days: Every weekday (M, T, W, Th, F) from July 5th through August 14
Class Times: 10 AM to 11:15 AM on Zoom
Office Hours: Wednesday and Friday immediately after class.

Class Location: Zoom Meeting
https://SDSU.zoom.us/j/83120959989?pwd=WjRFTnZxM29PTEw4Wk1ZNmpDdEREQT09
Meeting ID: 831 2095 9989
Passcode: 420433

Course attendance Policy: Students are expected to attend **ALL** Zoom lectures.

Syllabus is Subject to Change: This syllabus and schedule are subject to change in the event of extenuating circumstances. If you are absent from class, it is your responsibility to check on Canvas announcements made while you were absent.

About Your Instructor: Dr. Love is a Professor in the Chemistry and Biochemistry Department at SDSU. He is also the Director/Advisor for the Environmental Science major. Dr. Love runs a full-time research laboratory in which undergraduate, MS, and PhD students pursue projects in the field of Protein Design. We are currently working on a Department of Defense project in which we are designing proteins to bind and purify Rare Earth Elements (REE). One REE in particular, which is critical for the electrification of transportation, is neodymium due to its exceptionally strong magnetic properties. On a per weight basis, neodymium-based alloys are used to engineer stronger magnets than iron-based magnets and therefore it is needed to produce the highly efficient electric engines essential for the modernization of transportation. Another environmental based project in my laboratory (which will be discussed in this class) is the development of alternative sources of protein for human consumption. Existing examples of such include the 'Impossible Burger', 'Beyond Burger', and the company BlueNalu which produces alternative protein in cell-cultured seafood. Dr. Love and his undergraduate and graduate research students are working to develop bacterial fermentation methods to produce cheese that is independent of dairy (cow-less cheese). The goal is to produce nutritious protein using methods that greatly reduce the ecological damage and other issues associated with the industrial livestock industry.

COURSE DESCRIPTION

Environmental chemistry is the study of the local, regional, and global distribution of different chemicals and biochemical molecules within the environment. We will study the interactions of matter (chemicals) in the environment, both outdoors as well as within work and living spaces. This is a chemistry course, and therefore this course will help you think critically about complex environmental issues by applying key chemical knowledge and analytical skills in a scientific manner. There are currently many environmental problems and issues occurring on our planet. This course will emphasize how the specific discipline of chemistry will enable us to understand environmental issues, and also illustrate how scientists can work to alleviate the environmental problems the world is currently facing. During this course we will study the chemistry of air, water, land, minerals, and toxic chemicals as well as how human activities contribute to the different distributions of these elements. In doing so we will also examine the sources, reactions, transport, effects, and fates of chemical species found in air and water and how technology contributes both positively and negatively to these processes. This course covers many of the pressing issues in our environment today. Topics to be covered include atmospheric chemistry and air pollution, climate change and energy production and use, water chemistry and water pollution, and various toxic compounds. All students who take this course are expected to demonstrate a mastery of these topics through in class discussions and six online Canvas exams.

From the SDSU Catalog: Fundamentals of chemistry applied to environmental problems. Chemistry of ecosystems; analysis of natural constituents and pollutants; sampling methods; transport of contaminants; regulations and public policy. Maximum credit three units.

COURSE LEARNING OBJECTIVES

Following this course, students will be able to:

1. Demonstrate an understanding of atmospheric chemistry and air pollution.
2. Describe the make-up of matter in terms of its elemental and molecular composition.
3. Describe the greenhouse effect, climate change; and distinguish between fossil fuels and renewable energy technologies
4. Use chemical bonding models and molecular composition to recognize potential environmental impacts of substances (*e.g.,* water solubility, acidity).
5. Analyze environmental scientific data using the scientific method to apply the effects of environmental chemistry on the ecosystems.
6. Explain basic concepts of water chemistry and water pollution.
7. Describe how some chemical techniques are used to quantify the distribution and concentration of substances and use this kind of data as part of an evaluation of environmental impacts.
8. Demonstrate the ability to use ethical reasoning to articulate a position on important environmental issues.

Enrollment Information

Prerequisite

General Chemistry: At SDSU the only pre-requisite course that is required for this course (CHEM 571) is General Chemistry - CHEM200. Courses from other universities/colleges that are equivalent to the SDSU CHEM200 also function as a permitted prerequisite course.

Course Materials

Required Materials

- There is no required textbook. PDF files that contain notes/PowerPoint slides for all lectures are provided on the Canvas webpage for this course.
- All classes are conducted live, online through Zoom and will be recorded on the cloud and made available to all students after the daily class is over.
- Students will also be provided PDF files of newspaper, magazine, and scientific journal articles on the Canvas webpage for this course.

Recommended or Optional Materials

- Although it is not required, the following textbook is a great reference for Environmental Chemistry: Environmental Chemistry by Stanley Manahan, 10th Edition, CRC Press, ISBN 9781498776936 - CAT# K29755.

Course Structure

This course is being offered in an online format via Canvas and utilizes traditional lectures (on Zoom), collaborative group activities and individual assignments. Course information and content is housed in the Canvas (canvas.sdsu.edu) learning Management System (LMS).

Course Requirements:

- Course attendance Policy: Students are expected to attend **all** online lectures. Grades are based on the following:
  1. In class or at home reading of assigned articles and student participation in discussions following in class reading of some articles (25% of grade).
  2. Six 'open notes' exams that will be given at the end of each week (Friday) and will be due on the following Monday. The exams are based on all of the material covered in the previous week. Exams that students fail to take will be assigned a grade of zero.

Course Assessments and Scoring

Grade Scale

A	Excellent = 90-100%	B	Above Average = 80-89%
C	Average= 70-79%	D	Marginal = 60-69%
F	Unsatisfactory = 59% or below	I	Incomplete = Did not complete

Assignments and Weights

TABLE 1 –CATEGORY, ASSIGNMENT AND PERCENTAGE OF FINAL SCORE

Category	*Assignment*	*Percentage of Final Score*
Participation	Active participation for 'in class' discussions as well as online Canvas discussions	25%
Exams	Six 'open notes' exams administered at the end of each week (Friday)	75%
	TOTAL	100%

Assignment Details

25% of the final grade is derived from your participation in online class discussions. 75% of the final grade is derived from 6 exams. The exams are 'open notes" exams and will generally be made available on Friday afternoons/evenings and will generally be due late on Sunday evenings/Monday morning. The 6 exams will consist of between 25 and 75 multiple-choice questions that you will access via the Canvas Quizzes page on the class website. All questions will be derived from class material that was covered in the previous week.

Late Exam Completion Policy

Exams are considered late if they are submitted after the due date and time as shown on the course schedule. Late exams are accepted within 24 hours of the due date and time with a 25% deduction in points. Contact the instructor in advance if you are unable to complete an assignment.

Overall Course Outline

Chemistries, Processes, Pollutions, and other Environmental Concepts that will be covered in this course include the following:

Week 1:

- Introduction to class material and grading method
- Thomas Hartman article, Burning (Combusting) Ancient Sunlight
- Introduction to the Burgeoning Over Population Issue

- Introduction to Planetary Spheres and Atmospheric Spheres
- A more in-description of humanity's ongoing and extensive modification, and troublesome degradation of the biosphere.
- Canvas exam 1 on material covered during this week.

Week 2:

- Introduction to Atmospheric Layers
- Global Ocean and Atmospheric Currents, Correlated to Earth's Surface Temperatures
- Introduction to CO_2 Emissions, Global Warming and the Greenhouse Effect
- Canvas exam 2 on material covered during this week.

Week 3:

- Ozone, the Ozone Hole, "Ozone Hole: How We Saved the Planet", PBS Video
- Rachel Carson "A Silent Spring"
- Introduction to Modern Agriculture and the Green Revolution
- Possible guest Lecture on Atmospheric Rivers
- Possible guest discussion with members of the SDSU Environmental Health and Safety Department
- Canvas exam 3 on material covered during this week.

Week 4:

- Introduction to Modern Agriculture, "the Green Revolution"
- Haber-Bosch Process for Producing Nitrogen Fertilizers from Thin Air
- Genetically Modified Agricultural Products
- Hydroponics and Aquaponics
- Aquaculture, Promises, Problems, and the Future
- Canvas exam 4 on material covered during this week.

Week 5:

- Introduction to Energy, Personal Use.
- Food for Thought Experiment
- "A Crude Awakening - The Oilcrash"
- Crude Oil Origins and Historical Use
- Fracking: Production of Methane (CH_4); Benefits, Detriments, and Pollution
- Canvas exam 5 on material covered during this week.

Week 6:

- e2 energy - Documentary Series
- Chemical Composition and Properties of Crude Oil.
- Crude Oil and Ethanol Refinement Via Distillation
- Oil from Algae
- The Preponderance of Plastic Material in Our Societies, Recycling Problems, and Possible Replacements
- Canvas exam 6 on material covered during this week.

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Student Support

Writing Support

For help with improving your writing ability, the staff at the SDSU Writing Center is available online. Most students find it helpful to use technology tools to support the writing process. The following resources are provided as needed.

- Use a free Chrome browser plug-in such as Grammarly or MS Office tools to proofread and provide edits in real time in your own copy of MS Office.
- Review APA formatting:
  - APA Manual
  - Purdue University's OWL
  - APAStyle.org Quick Answers-Formatting
  - PC: Set up and use APA Formatting video or LibrarianEnumerations Blog
  - Mac: Set up and use APA Formatting video
  - Citation Machine tool for creating citations

Technical Support for Canvas

- https://its.sdsu.edu/canvas/

Expectations

Students are expected to complete all assignments on time, and participate fully in class activities and discussions.

The instructor will respond to student email within 24-72 hours and will provide grades for assignments within 1-2 weeks of the due date.

Netiquette

Netiquette is online etiquette and is applicable to all course communications. It is important that all students be aware of proper behavior and show respect to one another.

Netiquette guidelines are common sense and ask all to use appropriate language for an educational environment:

- Use complete sentences
- Use proper spelling and grammar
- Avoid slang and uncommon abbreviations
- Avoid obscene or threatening language

The University values diversity and encourages discourse. Be respectful of differences while engaging in discussions. Consult SDSU's netiquette guidelines for more information.

Success in an Online Course

To succeed in the online environment, students should have the following:

- A computer with a stable Internet connection.
- Basic computer skills – email, Internet, and basic word processing.
- Microsoft Office 2010, or newer (must include Word and PowerPoint) or equivalent.
- An SDSU email address that will not change from the beginning until the end of the term.
- A "technology back-up" plan to complete assignments in case computer or Internet fails.
- Sufficient time - Online courses require as much time as face-to-face courses.
- Self-motivation to work with minimal supervision.

Students are also required to:

- Make use of online course materials available via Canvas. Access to these materials is available after registration in the course.
- Participate in asynchronous online discussions.
- Complete readings and exams by the dates indicated on the schedule.
- Check email on a daily basis.

University Policies

Academic Honesty

The University adheres to a strict policy regarding cheating and plagiarism. These activities will not be tolerated. Become familiar with the policy and what constitutes plagiarism (http://studentaffairs.sdsu.edu/srr/cheating-plagiarism.html). Any cheating or plagiarism will result in failing this class and a disciplinary review by the University. These actions may lead to probation, suspension, or expulsion.

Examples of Academic Dishonesty include but are not limited to:

- copying, in part or in whole, from another's test or other examination;
- obtaining copies of a test, an examination, or other course material without the permission of the instructor;
- collaborating with another or others in work to be presented without the permission of the instructor;
- falsifying records, laboratory work, or other course data;
- submitting work previously presented in another course, if contrary to the rules of the course;
- altering or interfering with grading procedures;
- assisting another student in any of the above;

- using sources verbatim or paraphrasing without giving proper attribution (this can include phrases, sentences, paragraphs and/or pages of work);
- copying and pasting work from an online or offline source directly and calling it your own;
- using information you find from an online or offline source without giving the author credit;
- replacing words or phrases from another source and inserting your own words or phrases.

The California State University system requires instructors to report all instances of academic misconduct to the Center for Student Rights and Responsibilities. Academic dishonesty will result in disciplinary review by the University and may lead to probation, suspension, or expulsion. Instructors may also, at their discretion, penalize student grades on any assignment or assessment discovered to have been produced in an academically dishonest manner.

Accessibility

If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Ability Success Center at (619) 594-6473. You can also learn more about the services provided by visiting the Student Ability Success Center website.

To avoid any delay in the receipt of your accommodations, you should contact Student Ability Success Center as soon as possible. Please note that accommodations are not retroactive, and that accommodations based upon disability cannot be provided until you have presented your instructor with an accommodation letter from Student Ability Success Center. Your cooperation is appreciated.

Student Support Services:

A complete list of all academic support services is available on the Academic Success section of the SDSU Student Affairs website.

Classroom Conduct Standards

SDSU students are expected to abide by the terms of the Student Conduct Code in classrooms and other instructional settings. Prohibited conduct includes:

- Willful, material and substantial disruption or obstruction of a University-related activity, or any on-campus activity.
- Participating in an activity that substantially and materially disrupts the normal operations of the University or infringes on the rights of members of the University community.
- Unauthorized recording, dissemination, or publication (including on websites or social media) of lectures or other course materials.

- Conduct that threatens or endangers the health or safety of any person within or related to the University community, including
    1. physical abuse, threats, intimidation, or harassment.
    2. sexual misconduct.

Violation of these standards will result in referral to appropriate campus authorities.

Medical-related Absences

Students are instructed to contact their professor/instructor/coach in the event they need to miss class, etc. due to an illness, injury or emergency. All decisions about the impact of an absence, as well as any arrangements for making up work, rest with the instructors. Student Health Services (SHS) does not provide medical excuses for short-term absences due to illness or injury. When a medical-related absence persists beyond five days, SHS will work with students to provide appropriate documentation. When a student is hospitalized or has a serious, ongoing illness or injury, SHS will, at the student's request and with the student's consent, communicate with the student's instructors via the Vice President for Student Affairs and may communicate with the student's Assistant Dean and/or the Student Ability Success Center.

SDSU Economic Crisis Response Team

If you or a friend are experiencing food or housing insecurity, or any unforeseen financial crisis, visit sdsu.edu/ecrt, email ecrt@sdsu.edu, or walk-in to Well-being & Health Promotion on the 3rd floor of Calpulli Center.

Copyright Policy

SDSU respects the intellectual property of others and we ask our faculty & students to do the same. It is best to assume that any material (e.g., graphic, html coding, text, video, or sound) on the Web is copyrighted unless specific permission is given to copy it under a Creative Commons License. For more information about the use of copy written material in education, consult the TEACH Act and Copyright Fair Use Guidelines. Whenever possible, you should attribute the original author of any work used under these provisions.

Netiquette and Communication Guidelines

Consult SDSU's netiquette guidelines for information on appropriate communication.

Non-Discrimination Policy

SDSU is committed to providing a safe and welcoming campus environment for all students, faculty and staff. The CSU has affirmed its commitment to 'protecting access, affordability, intellectual freedom, inclusivity, and diversity for all students, including supporting DACA students.' Discrimination, harassment, or retaliation against students, faculty, and staff on the

basis of race, religion, gender, sexuality, disability, nationality, immigration status and other categories of identity is prohibited. If you have concerns about your status at the university, visit the Student Affairs site for information or contact the Dean of Students or the Assistant Dean for Student Affairs in your College.

Religious Observances

According to the University Policy File, students should notify the instructors of affected courses of planned absences for religious observances by the end of the second week of classes.

Standards for Student Conduct

The university is committed to maintaining a safe and healthy living and learning environment for students, faculty, and staff. Each member of the campus community should choose behaviors that contribute toward this end. Refer to the Center for Student Rights and Responsibilities to learn more.

Student Privacy / FERPA / Intellectual Property

SDSU complies with the federal Family Educational Rights and Privacy Act. Grades, personal identification and any other records will not be released to others without your express written permission. Refer to the Office of the Registrar for detailed information on student privacy.

The Family Educational Rights and Privacy Act (FERPA) mandates the protection of student information, including contact information, grades, and graded assignments. Your instructor may use [Canvas / Blackboard] to communicate with you, and will not post grades or leave graded assignments in public places. Students will be notified at the time of an assignment if copies of student work will be retained beyond the end of the term or used as examples for future students or the wider public. Students maintain intellectual property rights to work products they create as part of this course unless they are formally notified otherwise.

Land Acknowledgement

We stand upon a land that carries the footsteps of millennia of Kumeyaay people. They are a people whose traditional lifeways intertwine with a worldview of earth and sky in a community of living beings. This land is part of a relationship that has nourished, healed, protected and embraced the Kumeyaay people to the present day. It is part of a world view founded in the harmony of the cycles of the sky and balance in the forces of life. For the Kumeyaay, red and black represent the balance of those forces that provide for harmony within our bodies as well as the world around us.

As students, faculty, staff and alumni of San Diego State University we acknowledge this legacy from the Kumeyaay. We promote this balance in life as we pursue our goals of knowledge and

understanding. We find inspiration in the Kumeyaay spirit to open our minds and hearts. It is the legacy of the red and black. It is the land of the Kumeyaay. Eyay e'Hunn My heart is good.