ENVS15A Environmental Chemistry I
Winter 2018

Instructor: Helene K. Gardner, Ph.D. email: hkgardner@es.ucsb.edu
Please note that there is another hgardner on campus. Please be careful when emailing me.

Class Time and Location:
Lecture: 12:30-1:45 pm TTh; Buchanan 1920
Sections:
- T 2:00-2:50 pm Girv 2123 Zhiping Bao
- T 3:00-3:50 pm HSSB 1237 Zhiping Bao
- W 8:00-8:50 am HSSB 4202 Matt Gargiulo
- W 6:00-6:50 pm Girv 2108 Matt Gargiulo
- Th 8:00-8:50 am HSSB 1236 Matt Gargiulo
- Th 6:00-6:50 pm Arts 1356 Zhiping Bao

Office Hours:
Dr.G.: 2:15-3:45 pm TTh, Bren 4017; 12:40-1:40 pm WF at the dining tables by Subway in the UCen; or by appointment. Please don’t let your inability to come at the scheduled times prevent you from seeking help. I’ll be glad to meet with you at a time and place of our mutual convenience.

Z and Matt will let you know in section when and where their office hours will be.

The new Environmental Chemistry series is designed to fulfill the chemistry requirement for environmental studies majors working toward a B.A. degree, however students seeking the B.A. do not have to take this series; ENVS B.A. students are free to fulfill their chemistry requirements with the chemistry department. If you elect to fulfill the requirement with ENVS 15A and 15B, understand that both courses in the series are required, and both must be passed to fulfill this requirement. If you have, unfortunately, gotten caught with part of the old requirement fulfilled (CHEM1A, but not ENVS15), we are sorry, but you will need to take (and get full credit for) both ENVS15A and ENVS15B. This is not a course/series for chemistry or other science majors. Those majors should take the environmental chemistry course offered through the chemistry department, CHEM123.

The series is organized by environmental media (rocks then water then air) and is an introduction to key chemical principles presented in an environmental context and with a nod to what chemistry is helpful for environmental professionals to know. In this first course, we will study nuclear phenomena, balancing equations, the origin of the elements, the periodic chart, ionic solids, oxidation and reduction, molecules, the composition of the Earth, and mining and mine waste. In the second course, mining will be continued and will expand into the characteristics of water, water quality, the formation of sedimentary rock, fossil fuels and their combustion, the formation of the atmosphere, and such atmospheric issues as the hole in the ozone layer and global climate change. In the second quarter, a mandatory laboratory course accompanies the lecture course.

Course Objectives:
- Learn fundamental chemical concepts in an environmental context
- Learn basic chemical facts in an environmental context
- Observe, learn, and practice problem solving
- Practice finding information, evaluating its veracity, developing an answer to a question, and presenting that answer clearly
There are no prerequisites for the course

Required:
An iClicker (please obtain and register before the 2nd class)

Recommended Texts:

Tentative Topics and Schedule:
L1: Intro, policies, syllabus; Stanley Watras problem solver
L2: Stanley Watras solution, units of radiation, background radiation, U worker standard, elements, symbols, periodic chart, protons, atomic mass, neutrons, isotopes, nuclides, atomic mass, mole
L3: electrons, positrons, belt of stability, types of nuclear emissions to become more stable
L4: nuclear equations, Law of Conservation of Mass, types of radiation, radioactive decay, detection, decays series, decay daughters
L5: mass defect, $E = mc^2$, binding energy, most stable isotope, fission, fusion
L6: nuclear weapons
L7: nuclear power plants, radioactive half-life, environmental contamination
L8: how atoms came to be, cosmic abundance of elements, electronic organization: orbits vs orbitals
MIDTERM
L9: electronic configuration, valence, Lewis structures
L10: periods and groups of elements on periodic chart, allotropes
L11: properties of metals, nonmetals, metalloids, periodic properties
L12: oxidation/reduction, cations/anions, Lewis structures
L13: ionic bonds, compounds, salts, characteristics and formulae of ionic compounds, covalent bonds, molecules, characteristics and formulae of molecules
L14: Law of Definite Proportions, naming molecules, polar bonds and molecules
L15: Hadean and Archaean Earth, modern Earth inner and outer core, inner and outer mantle, silicon dioxide as a network solid
L16: silicates in tetrahedral form, asthenosphere, crust, igneous rocks, relative abundance of elements on Earth
L17: other minerals besides silicates, other polyatomic anions, ores, mining, refining, smelting, mining waste

The final exam is Monday, March 19, 12-3 pm. Please be there.
Grading: A scientist must have a working knowledge of her subject matter committed to memory. Developing hypotheses requires creativity, but one cannot be creative in a vacuum; creativity uses basic information as a springboard. If you don’t know the basics, it takes the spring out of your board.

For example, if all the fish downstream of a zinc mine die, scientists may be called on to come up with an explanation. A hypothesis based on fact (gee, didn’t we see something like this in western Europe in 1816?; don’t fish die when aqueous pH is low?; it’s been noticed that all the small mammals near the mine have also disappeared) rather than fantasy (aliens from outer space zapped them with death rays) or ignorance (beats me why those fish died; must be an unfortunate coincidence) is going to have a greater chance of being correct.

Memorization usually comes through repeated use. We will build on material as we go through the course, but some, unfortunately, we will only visit once, so I encourage you to work actively on your own to memorize material as it is presented. Problems from the text will be suggested, and problem sets will be posted on GauchoSpace. They will be reviewed in recitation but not graded; they are an excellent opportunity for you to practice new skills. Quizzes on the material of the problem sets and on lecture will be given weekly.

Also important to scientists is the ability to solve problems. I am looking for you to develop problem-solving skills in this course. That, more than memorization, is what the practice of science entails. I want you to learn how scientists have solved real problems, and I want you to practice doing the same thing. Part of that involves finding, evaluating, and using information. I want you to know where to find information and how to use it. Written homework assignments will develop these skills, as will engaging with lecture and following the solution of an environmental problem as it is resolved. I cannot evaluate your engagement with lecture, as I do not want to grade your iClicker responses, but homework assignments in the form of written papers will be made occasionally.

Your grade will be determined as follows:

- **Quizzes and Papers**: 60%
- **Midterm**: 10%
- **Final Cumulative T/F, Short Answer Exam**: 20%
- **Attendance**: 10%

Quizzes are a large part of the grade for this course and are your best opportunity to prepare for the exams, as their format (T/F, short answer, and few fill-ins) is the same as the final. They also give you a glimpse into my mind: what I think is important, how I assess understanding, etc. Expect one every week on the problem sets and lecture material from the previous week depending on where we are in the quarter. Cheating will not be tolerated, and the student code of conduct will be enforced with vigor.

Papers are evaluated on a par with quizzes. They are assigned occasionally. When I say papers, I mean writing a paper that requires you to research the answer to a question using online resources and report that answer clearly in a specific format. Some format issues will be graded, and failure to comply will reduce your grade. It is also expected that you will use good English. Glaring errors will be marked down. The opportunity for turning in work that is not your own is great when the work is done outside of class. Therefore, cheating will not be tolerated, and the student code of conduct will be enforced with rigor. If student work is found to be comprised of a significant amount of unoriginal work (without appropriate citation), it will be given a zero. Cheating is also a waste of time. A better use of your time would be to actually do the work/learn the material yourself.
Everyone is expected to take every quiz and write every paper.

Late work will not be accepted.

**However, the lowest score of the combined homework and quiz grades will be dropped.** What that means is you can get your schedule muffed up – by disease, romance, travel, family issues, whatever – and not have it affect your grade. If disease, romance, travel, family issues, whatever continue to play havoc with your ability to do the work for this class, it will affect your grade. I understand that disease, romance, travel, family issues, whatever happen, but I don’t like playing God and having to decide whose excuse is legitimate and whose isn’t, so, **after invoking any excuse (and, therefore not turning in homework or taking a quiz) once, no excuse will be accepted (a score of zero will be entered).**

For those of you who will invoke one of these early in the course, asking for a second homework or quiz grade to be dropped (even if you have a note from health services this time) won’t work, so try to put off life disruptors as long as possible. Many students manage perfect attendance.

**Extra credit will not be given.** My stock answer to requests for extra credit goes something like, “I want you to learn what I tell you I want you to learn, so learn it. Your time is better spent learning that than learning stuff I really don’t care whether you learn or not. Further, if you don’t have time to learn the stuff I want you to learn, how on earth are you going to have time to learn stuff I really don’t care whether you learn or not? Spend your time learning what I want you to learn.”

I used to give a take-home midterm. I don’t anymore. Some students seemed to think that “take-home” meant “please feel free to cheat,” which was not correct. We will instead use one of our lecture periods for an in-class midterm that will be nerve-wracking because it is timed. I am sorry about that. No, a cheat sheet will not be allowed; memorization will be required.

The cumulative final will be given during the assigned final exam slot barring fire, flood, or other natural or man-made disaster. This will be **Monday, March 19 12-3 pm.** Please plan to attend. No, a cheat sheet will not be allowed; memorization will be required.

**Attendance means showing up on time and staying until the end.** If you show up late, leave early, fall asleep, or are distracted during class by all the nifty stuff the technology you bring to class can do, you’ll miss some of the course material. I work hard to make the presentation coherent. If you miss part of the presentation, it will be…less coherent. Also, giving you credit for showing up positively reinforces behaviors that adults hope all young people learn: showing up is a big part of success.

IClicker questions will be used to assess attendance in lecture. Please also know that late arrival/early departure/inattentiveness is given half attendance credit BUT that full attendance is only 17 classes, so you get a free pass.