ENVS15A Environmental Chemistry I  
Winter 2017

**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  HSSB 3202  Zhiping Bao  
- T 3:00-3:50 pm  HSSB 2204  Zhiping Bao  
- W 8:00-8:50 am  HSSB 1236  Erin Winslow  
- W 9:00-9:50 am  HSSB 3202  Erin Winslow  
- Th 9:00-9:50 am  Phelps 1448  Zhiping Bao  
- Th 8:00-8:50 am  Girv 2119  Erin Winslow

**Office Hours:**
Dr.G.: 2:00-3:30 pm TTh, Wednesday 10:30-12:00 or by appointment; Bren 4017. 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 your convenience.

Erin and Z 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. Both courses in the two-course series (ENVS15A and 15B) are required, and both must be passed. If you have, unfortunately, gotten caught with part of the 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.

This course 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. We will study the periodic chart, the origin of the elements, nuclear phenomena, molecules and ionic solids (bonding), the composition of the earth, the interface of the lithosphere with water and air, weathering, chemical reactions, stoichiometry, solutions, pH, electrochemistry, the hydrosphere, and water quality.

**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
**Recommended Texts:**

**Tentative Topics and Schedule:**
- **Lecture 1:** Stanley Watras
- **L2:** elements: protons, neutrons, atomic mass, mole isotopes, belt of stability, types of emissions to become more stable
- **L3:** ionizing radiation, nuclear equations, U-238 series
- **L4:** half-life, radon risk
- **L5:** artificial transmutation, \( E = mc^2 \), binding energy, fission
- **L6:** weapons, power plants, fusion
- **L7:** electrons, orbitals, periodic chart, Lewis symbols
- **L8:** properties of nonmetals, metals, metalloids
- **L9:** where are the elements from?
  - lithosphere: core (mixtures)
- **L10:** lithosphere: mantle (ionic and covalent bonds; Lewis structures; definite proportions; mole
- **L11:** rock
- **L12:** minerals
- **L13:** Iron Mountain Mine
- **L14:** characteristics of water (intermolecular forces)
- **L15:** physical vs chemical weathering (types of chemical reactions)
- **L16:** oxidation/reduction reactions
- **L17:** acids and bases
- **L18:** sedimentary rock formation
- **L19:** continental waters
- **L20:** water quality

The **final exam** is Monday, March 20, 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. Problem sets will be distributed weekly in lecture and
reviewed in recitation but not graded. **Quizzes on the material of the problem sets and on lecture will be given biweekly.**

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 made about every other week will be made.**

Your grade **may** be determined as follows:

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

When I say, “may,” I mean your grade distribution is up to you and will be contracted for. The contract will be filled out in your first recitation section, so please be prepared to do so. If you don’t want to come to class, please do not come and do not contract for attendance to be included in your grade; you will need to distribute those ten percentage points to another category or two, say 5% more for quizzes and papers and 5% more for midterm. The grade distribution indicated above addresses all learning styles, all learning objectives, and has pretty much been developed over my thirty years of experience to best teach students and help them earn the best grades. You are not, however, required to use it.

**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.

IClacker 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 19 classes, so you get a free pass.

**Quizzes** are also a large part of the grade for this course and are your best opportunity to prepare for the final, 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 other week on the problem sets and lecture material from the previous week or two depending on where we are in the quarter. Again, cheating will not be tolerated and the student code of conduct will be enforced with vigor.

**Papers** are a large part of the grade for this course. Expect one about every other week. 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, the student code of conduct will be enforced with vigor. **Cheating will not be tolerated.** If student work is found to be comprised of a significant amount of
unoriginal work (without appropriate citation), it will be given a zero. Period. 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 take every quiz and write every paper.

Late work will not be accepted. This is, as the above, another of those this-is-what-adults-want-you-to-learn, you-might-as-well-get-used-to-the-work-ethic-of-this-profession things.

However, the lowest score of the 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 have a note from health services this time) won’t work, so try to put off life disruptors as long as possible. Discipline yourself; this is another one of those habits that will serve you well when you graduate. 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.”

More detailed and therefore more likely to go wrong schedule:

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<tr>
<th>Date</th>
<th>Topics</th>
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<td>1/19</td>
<td>L1 intro; Watras R1A/B contracts conversions</td>
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<td>1/17</td>
<td>L3 ionizing rad, nuclear equations R2A/B</td>
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<td>L5 artif trans E=mc2, fission R3A/B</td>
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<td>L7 e, orbitals, per chart, Lewis R4A/B</td>
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<td>2/7</td>
<td>L9 origin o ele, earth core (mix) R5A/B</td>
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