Syllabus – Chemistry 109H Fall 2019

Class meeting	MWF at 8:50am – 9:40am, Educational Sciences room 204
Instructor	Prof. AJ Boydston (Prof. Boydston or Dr. Boydston is fine) 7365 Chemistry, aboydston@wisc.edu (put CH 109H in your subject line)
Teaching Assistants	Meg Tetzloff, mtetzloff@wisc.edu Ray Czerwinski, rczerwinski@wisc.edu
Office Hours	Prof. Boydston: Tuesday 12 noon, Monday 1:30pm, in 7365 By appointment: send an email with CH 109H in subject line, indicate days and times you are available to meet, say whether it needs to be one-on-one (private topic) or open (course materials) Meg Tetzloff: Tuesday 8:50am – 9:40am, Wednesday 5:30pm – 6:30pm Ray Czerwinksi: Monday 5:30pm – 6:30pm, Tuesday 1pm – 2pm

Chemistry 109H is the honors version of Chemistry 109, a modern introduction to chemical principles that draws on current research themes. The honors section is for students with particularly strong back-grounds in chemistry and good preparation in physics and mathematics. Although the course involves only small amounts of formal calculus, familiarity with calculus and at least concurrent enrollment in calculus has historically been useful. Students who have NOT taken AND are NOT currently enrolled in calculus have done well in the class, but it is more difficult.

The plan for the course is to develop the organizing principles of chemistry and apply them to questions of energy and global climate change. The unifying theme in the course is using fundamental concepts to think critically about energy production and consumption as well as their impact on the environment. In many cases, we will draw in examples from current research to highlight how concepts are applied.

The course begins with a discussion of energy and moves to a rigorous description of thermodynamics, a topic that sits at the heart of energy production and use. After developing the concepts of entropy and free energy, the next step is applying them to spontaneous change and equilibrium, in both gases and solution. The combination of solution equilibrium and free energy leads into electrochemistry, a topic central to solar energy conversion and storage, as well as contemporary chemical synthesis. All of these concepts turn on the interaction of molecules with light, and the course moves on to examine light, atoms, and molecules. Combining these ideas makes it possible to discuss atmospheric photochemistry. Because understanding the rates of processes is important to energy production and reactions in the atmosphere, the course develops and applies ideas of chemical kinetics. Nuclear reactions and their connection to energy production are the final topics in the course.

Materials

Text University Chemistry: In the Context of Energy at the Global and Molecular Level by James G. Anderson. This book is a preprint of a new text. It comes in two volumes. We will make PDF files of the text available on Canvas. Purchase of a physical copy of the textbook is recommended but not required.

Lab Manual Laboratory Manual for Chemistry 109H, 2018 (sold in room 1375)

Notebook Carbonless laboratory notebook with duplicate pages. Available at local bookstores or from Alpha Chi Sigma.

Safety Goggles You are required to wear safety goggles when in the laboratory. We cannot admit you to the laboratory without goggles (safety glasses are not good enough!). Alpha Chi Sigma and local bookstores sell safety goggles that will fit over regular glasses.

Calculator A scientific calculator. Graphing calculators are acceptable for use in the course.

Procedures and Policies

Website Canvas is the place for you to obtain current information about the course, to find links to the material presented in the course, to find reference materials and resources, and to take online quizzes, and to check your grades. The website lists all assignments, and it is important that you use it to see when quizzes and problems sets are due.

Email Your UW email address is our primary means of contacting you during the semester. We will send messages to the entire class and to individuals using those addresses. Please be sure to check that account or have it forwarded to an account you see regularly.

Class Meetings Your attending class is important. The class meeting will expand on material in the text, point to the most important aspects of the material, and, if things go well, stimulate discussion. I will post copies of the notes I use in class on the course website (as a PDF file you can view and print) shortly after the lecture. These notes are detailed enough for you to revisit points you missed in class, but they are not a substitute for the text or for your own notes.

In-class Work I use in-class work to adjust to the flow of the class and enrich our discussion of certain topics. Since you'll do the work, I'll assign some value in your grade calculation. The in-class work is not a pop quiz, nor an attendance monitor. If you miss the discussion, you won't get the full benefit of the activity. You can still make up the missed in-class work, though. You need to email Prof. Boydston as soon as you realize you missed an in-class activity. When I anticipate an in-class activity, I'll announce it. No intended surprises.

Discussion You will meet with your teaching assistant for a discussion period each Thursday. Your teaching assistant will answer questions, discuss the material, and guide you through assignments that expand on the material discussed in the class meeting.

Quizzes There will be a quiz in each discussion section. I will provide a total of 15 quizzes, one each week. The first one (quiz 0) will not be graded. We will also not grade quizzes immediately preceding an exam (those are just for your practice). Then, we'll drop your two lowest graded quiz scores, for a total of 9 graded quizzes used in the grade calculation. There are no make-up quizzes; the two dropped scores are there to absorb the need to be away occasionally. Each quiz will be weighted equally. Quizzes are done in groups (3-4 students) and the entire group receives the same grade. This is to encourage you to debate incorrect answers and defend correct ones. The scoring is binary on each question (either perfect or zero) and the TAs are asked to be blunt during discussion section. Note that an incorrect answer actually weighs very little on your grade, but it's the context of perceived high stakes that helps with the exercise.

Examinations There are 3 examinations during the semester and NO final examination. All exams are done during class time. The first three examinations will be *September 20, October 21, and December 6.* In addition, there will

be a 4th exam period on December 11. The 4th exam is a chance to replace one of the earlier exams. You pick which exam you want to redo (I will write you a new exam on the same topic, you keep the higher of the two scores).

Laboratories The teaching assistants supervise the laboratories and direct your work. They will discuss related material, demonstrate unfamiliar techniques, and answer questions. The goal of the laboratory is to provide experience with a variety of techniques and to illustrate the principles we are discussing in lecture. We especially want you to learn to generate quantitative results and to interpret them critically.
You must come to laboratory prepared. Before coming to the laboratory, you must read and understand the procedure and complete the preparations described by your teaching assistant. Your teaching assistants will give you more detailed instructions for the pre-laboratory assignments.

Conflicts If a religious observance or an official University activity conflicts with any scheduled activity in this course, please notify me at the beginning of the semester. We will work together to accommodate any needs.

Illness If you are ill or have another unexpected reason that you are unable to attend an exam or laboratory please inform your teaching assistant and Professor Boydston as soon as possible. Sending an email message is the best means of informing us of the problem.

Grading We grade the exams on a numerical scale and provide letter grade guidelines for each exam. Problem sets, quizzes, and laboratory reports also receive numerical grades. The aggregate of the points you accumulate on these assignments determines your grade. The points for the various components are

Exams (1@12%, 2@19%)	50% of your grade
Laboratory (each one counts)	25% of your grade
Quizzes (9 graded and included)	15% of your grade
In-class work (amount unpredictable)	10% of your grade

Schedule of Activities

We'll adjust as we go, but this is a good estimate of the sequence of events.

Week	Dates	Lecture Activities	Discussion Quiz	Lab Title
Week 1	9/4 - 9/6	Intro, Ch 1	Intro, quiz 0*	*none*
Week 2	9/9 - 9/13	Ch1, Ch 3	quiz 1	Cit. Lab
Week 3	9/16 - 9/20	Ch 3, Exam 1	quiz 2*	Sol. Cal.
Week 4	9/23 - 9/27	Ch 3, Ch 4	quiz 3	Heat & Light
Week 5	9/30 - 10/4	Ch 4, Ch 5	quiz 4	Capturing Light
Week 6	10/7 - 10/11	Ch 5, Ch 6	quiz 5	LeChat.
Week 7	10/14 - 10/18	Ch 7	quiz 6	CE&T
Week 8	10/21 - 10/25	Ch 8, Exam 2	quiz 7*	*none*
Week 9	10/28 - 11/1	Ch 8	quiz 8	Titrations
Week 10	11/4 - 11/8	Ch 9	quiz 9	E.Chem. Cells
Week 11	11/11 - 11/15	Ch 9, Ch 10	quiz 10	Emission Spec.
Week 12	11/18 - 11/22	Ch 10, Ch 12	quiz 11	Mol. Geo.
Week 13	11/25 - 11/27	Ch 12	quiz 12	*none*
Week 14	12/2 - 12/6	Ch 13, Exam 3	quiz 13	Erioglaucine
Week 15	12/9 - 12/13	research, Exam X	quiz 14*	none

*not graded