

CH145 Fall 2014: Syllabus and Course Information

Instructor: Tom Shattuck **Office:** Keyes 213 **Tel:** x5759 **e-mail:** twshattu@colby.edu

Office hours: W 10-11 & TT 10-11 (please drop by any time)

Course webpage: <http://colby.edu/chemistry/CH145/CH145Home.html>

Lecture: 10:00-10:50 in Olin 1 **Laboratory Location:** 1:00-3:50 in Keyes 409

Required course materials:

- **Textbook:** Chemistry, 5th Ed., J. Olmstead III and G. M. Williams (ebook and print ed.)
- **Homework:** "Sapling Learning" one-semester access code (saplinglearning.com)
- **Lab:** Bound laboratory notebook (Please no wire-spiral notebooks)
- **Calculator:** Sharp EL-501XB (only, available in the bookstore)

Course objectives and learning goals:

1. For students to gain an understanding of chemistry that supports their broad interests in science, computer science, environmental science, neuroscience, biology, geology and physics. The course also prepares students for Organic Chemistry and other advanced chemistry courses.
 - a. To learn to communicate using the nomenclature used by chemists.
 - b. To understand the basic structure of the atom and its subatomic particles.
 - c. To learn the basic principles of mass balance.
 - d. To understand the nature of the chemical bond.
 - e. To understand how chemical reactivity regulates the world in which we live.
2. For students to sharpen their quantitative skills in a scientific context.
3. For students to improve skills in solving problems that involve the integration and synthesis of new knowledge and to master the interface between narrative and mathematical problem solving.
4. For students to think critically through their analyses of experimental data.

Perseverance is an important key to success. Stay involved and up-to-date on the homework.

Anticipated course topics and approximate schedule:

Week	Chapter	General topic
1: Sept. 3	7	Atoms and Light
2: Sept. 8	8	Atomic Energies and Periodicity
3: Sept. 15	9	Fundamentals of Chemical Bonding
4: Sept. 22	10	Theories of Chemical Bonding
5: Sept. 29	11,2,12	Intermolecular Forces, Properties of Solutions
6: Oct. 6	13	Kinetics: Mechanisms and Rates of Reactions
7: (fall break) Oct. 15	14	Principles of Chemical Equilibrium
8: Oct. 20	15	Aqueous Acid-Base Equilibria
9: Oct. 27	16	Applications of Chemical Equilibria
10: Nov. 3	16,6	Applications of Equilibria, Thermochemistry
11: Nov. 10	17	Spontaneity of Chemical Processes
12: Nov. 17	18	Electron Transfer Reactions
13: Nov. 24 (Thanksgiving)	19.1-19.3	The Transition Metals
14: Dec. 1	20	The Main Group Elements

Grading:

- **Exam 1 (12%)** – Tuesday, September 30 from 5:00-7:00 PM in Olin 1.
- **Exam 2 (12%)** – Tuesday, October 28 from 5:00-7:00 PM in Olin 1.
- **Exam 3 (12%)** – Thursday, November 20 from 5:00-7:00 PM in Olin 1.
- **Final Exam (24%)** – Cumulative (date, time, and room to be assigned by registrar)
- **Laboratory (30%)** – Attendance is mandatory. You must have a passing grade in lab to pass CH145. For more information on the Laboratory, please visit the CH145 webpage.
- **Homework (10%)** – See below for more information.

Course and Departmental policies, including Academic Dishonesty:

1. Student collaboration: We strongly encourage students to work together in preparing for class and laboratory. Small group discussions are very useful in generating ideas that aid in problem solving and stimulate learning. Problem solving is an important part of chemistry and often it is the best way to learn material in chemistry courses. You are encouraged to work together on practice problems from the text. On individual work that is used for course or laboratory grading, however, any assistance that you give or receive from another student must be limited to correcting errors in the data as recorded in the laboratory. It is not appropriate to give your work, including spreadsheets, to another student for copying or comparison. Your course instructors are always eager to help – please ask us!

All material that you submit for a grade must be the result of your own thoughts and work. Graded work includes exams, quizzes, lab reports, and on-line homework. Lab reports and graded homework are just as important with regards to academic dishonesty as tests. Science advances through the honest and careful reporting of laboratory and theoretical work. Note that this policy includes both calculations and answers to questions in laboratory write-ups. In lab, your collaboration ends with collection of data.

Academic dishonesty can take many forms including, but not necessarily limited to:

- Looking at or copying material from another student's work, or allowing another student to copy any of your work.
- Using any sources or materials during an exam that are not expressly allowed by the instructor, creating such materials and leaving them in a location where they might be used by you or another student (all such materials should not be brought to the exam; they may not be on the floor, hidden in your exam, written on your hand, programmed into an electronic device, left in the bathroom, halls, or surrounding area, etc.).
- Altering your exam in any way after it is returned when asking for regrading of a portion of an exam.

These policies are consistent with both the College's policy on academic honesty as discussed in the Student Handbook as well as the Chemistry Department's policy at:

<http://www.colby.edu/chem/about/chemistry-attendance-and-exam-policy/>

2. Extra help: Please see Professor Shattuck as soon as possible if you have any questions about course or lab material. Help is also available at the Chemistry Help Center, staffed by experienced and knowledgeable chemistry majors, which is open four evenings per week in Keyes 104 (M-Th, 7:30-9:30pm). These students will be happy to answer questions and help with problems.

3. Exams: There will be three one-hour exams outside of class time (see dates above) and a final exam during the exam period. To allow for universal access, all students may take up to two hours to complete the one-hour exams. Exam questions may come from lecture, lab, the text, and/or homework and will be a mix of multiple choice, mathematical problems, and short answers. Please note that you must show your work on arithmetical problems for credit and partial credit.

Students are required to take all exams, and there are NO MAKE-UP EXAMS. If a student must be away for an official College activity, we will arrange for exams to be administered by a coach or other non-student person who accompanies the student. It is the responsibility of the student to let your professor know, well in advance, of any possible trips and to arrange with a person (for example, your coach) to administer the exam.

You must have your advising Dean contact your course instructor if you want to be excused from an exam for a medical or family emergency. You must authorize the Health Center to report your illness to your advising Dean. The grade for an unexcused missed exam is zero. The grade for an exam missed due to an excused absence will be calculated based on your three remaining unadjusted exam grades, normalized by the class average. Students with documented learning differences should follow college policy to arrange for accommodations during the first two weeks of the semester.

Important note: To encourage students to perform to the best of their abilities and to work towards improvement, all hour exams will be adjusted based on future test scores. All hour-exam grades will be adjusted upwards by replacing the exam score with the average of that exam grade and the subsequent unadjusted exam grade (the final exam will be used to adjust the third exam grade). Note that this recalculation is automatic, and will only be applied if it improves your grade.

4. Homework assignments: The homework portion of your grade will be derived from online homework, “Sapling Learning.” You must purchase an access code from the bookstore or online (directly through the homework website) and set up an account at www.saplinglearning.com according to the instructions that you can download from the CH145 website. There will be graded online homework problems due at the beginning of each class. These assigned problems predominantly involve quantitative problem solving. To compensate for on-line access issues, forgetfulness, busy student schedules, and electronic dogs that may eat your homework, we will automatically drop the four worst homework grades.

In addition, optional practice problems will be assigned from the back of the textbook chapter and online through Sapling. Work through as many of these problems as necessary to make sure you have a good grasp of the material. *The key indicator of success in this course is the ability to work through problems without depending on an answer key or on the online ‘hint’ feature.*

5. Electronic Devices: Electronic devices, such as laptop computers, cell phones, and tablets can be useful educational tools to facilitate learning. However, used inappropriately, electronic devices can be a significant distraction to other students. We request that students be respectful of other students and the instructor when using electronic devices during lecture or lab.

Week	Chapter	Topic	Test
1-9/3	7.1-2 7.3-4	<u>Atoms and Light</u> Particles and Waves Properties of Electrons, deBroglie, Spectroscopy, Bohr	
2-9/8	7.5-6 8.1-3 8.4-6	<u>Atomic Energies and Periodicity</u> Quantum Mechanical Model, Quantum Numbers, Orbitals Electron Spin, Periodic Table, Aufbau Principle Periodicity, Polarity, Ionic Compounds	
3-9/15	9.1-2 9.3-4 9.5,19.2	<u>Fundamentals of Chemical Bonding</u> Lewis Structures, Octet Rule, Resonance Electronegativity, Structure, Molecular Shape, VSEPR Properties of Chemical Bonds, Balancing Redox Reactions	
4-9/22	10.1-2 10.3-4 10.5-6	<u>Theories of Chemical Bonding: Covalent Bonding, Orbitals</u> Orbital Overlap, Hybridization Multiple Bonds, Molecular Orbital Theory: Diatomics Delocalized Electrons and Molecular Orbitals	
5-9/29	11.2 12.1-3 12.4-5	<u>Effects of Intermolecular Forces</u> Types of Intermolecular Forces <u>Properties of Solutions</u> Composition, Energetics, Solubility, Vapor Pressure Colligative properties, BP-Melting Point-Osmotic Pressure	Ch 7-9:9/30- Tuesday
6-10/6	13.1-3 13.4-5 13.6-7	<u>Kinetics: Mechanisms and Rates of Chemical Reactions</u> Rate Laws, Concentration and Reaction Rates Experimental Kinetics: Integrated Rate Laws, Mechanisms Rates and Temperature, Catalysis	
7-10/15	14.1-3 14.4-5	<u>Principles of Chemical Equilibrium</u> K_{eq} , Pressure, Heterogeneous Processes, Le Chatelier's Principle Applications, Aqueous Solutions	Fall Break
8-10/20	15.1-2 15.3-5 15.6-7	<u>Aqueous Acid- Base Equilibria</u> Equilibria, Strength, pH, Polyprotic, Salts Weak Acids and Bases Structure, Oxides, Lewis Acids	
9-10/27	16.1-2 16.3 16.4	<u>Applications of Chemical Equilibria</u> Common Ions, Buffers, Buffer Preparation Acid-base Titrations, Indicators Solubility Equilibria	Ch 10-14:10/28- Tuesday
10-11/3	16.4-5 6.2-3 6.4-5	Complexation Equilibria <u>Energy and its Conservation: Thermochemistry</u> Thermodynamics: Heat, Work, Internal Energy Calorimetry, Hess's Law, Enthalpy	
11-11/10	17.1-2 17.3-4 17.5-6	<u>Spontaneity of Chemical Processes: Entropy and Free Energy</u> Spontaneity, Entropy, Second Law Pure Substances, Chemical Reactions, Free Energy, Work Pressure, Concentration, Equilibrium	
12-11/17	18.1, 18.3 18.4 18.5-7	<u>Electron Transfer Reactions</u> Electrochemistry, Galvanic Cells, Cell Potentials Electrical Work, Free Energy, Concentration Electrolysis	Ch 15-17:11/20- Thursday
13-11/24	19.1-3	<u>Transition Metals</u> Coordination Complexes, Bonding in Coordination Complexes	Thanksgiving
14-12/1	20.1-2 20.3-4 20.5-6	<u>Main Group Elements</u> Lewis Acids and Bases, Hard and Soft Lewis Acids and Bases Main Group Metals, Metalloids Phosphorus, Other Nonmetals	