CHEMISTRY 108: *SOLAR ENERGY*
SPRING 2013 SYLLABUS

I. STUDENT LEARNING GOALS
(1) To understand important **challenges to societal energy use**, such as:
- relationship of global energy use to growth in population and industrialization
- trends in energy use in various forms
- oil production rates and availability
- fossil fuel combustion and carbon dioxide emissions
- types of alternative, renewable and sustainable energy systems

(2) To develop skills for **thinking critically and assessing scientific arguments** about alternative energy systems, such as:
- net energy balance
- capacity (abundance and availability) of primary energy sources and materials
- environmental impact

(3) To acquire knowledge and understand **chemical principles** associated with societal energy systems, including:
- molecules and chemical reactions
- light energy
- chemical bond energy and thermochemistry
- energy conversion and the laws of thermodynamics
- light absorption and excited states
- electron-transfer (redox) chemistry

and **memorize** a core set of chemical terms, definitions and equations[*] (to be provided).

(4) To use **quantitative reasoning** to solve example problems related to energy systems:
- unit conversion analysis
- solving algebraic equations for an unknown variable
- calculations involving scientific notation and exponents
- analysis of graphical data

Throughout the semester, you will be notified of specific learning goals for each topic we study.

II. CLASS MEETING TIMES   Period 4 (11:10−12) in Sam Mather 215

III. INSTRUCTOR
Prof. Scott D. Cummings
Phone: PBX 5355   E-mail: cummingss@kenyon.edu
Office: Tomsich Hall 314
Office Hours: *TBA*   My schedule is posted on my office door and at:
                              http://chemistry.kenyon.edu/cummings/schedule.htm

---

[*] "*Science is built with facts as a house is with stones — but a collection of facts is no more a science than a heap of stones is a house.*"   —Jules Henri Poincare (1854-1912)

IV. REQUIRED MATERIALS
- *Chemistry in Context* 7th edition (ISBN 978-0073375663)
- *Energy, Environment, and Climate* 1st edition by Richard Wolfson (ISBN 978-0393927634)
- a *Casio FW-260 solar scientific calculator* (*bring to every class*)

Note: Reading assignments will be based on these editions. Students purchasing any other edition will need to reconcile any differences between text editions.

Important CHEM 108 course materials (schedule; weekly reading assignments, Study Guides, quizzes, and problem sets; exam information; announcements) are available at: http://moodle.kenyon.edu (log in and select CHEM 108). These materials are not distributed in class. Some class announcements may be made by e-mail to your Kenyon account.

V. COURSE and COLLEGE POLICIES

A. PRE-REQUISITES: High school level (SAT or ACT) mathematics and chemistry.

B. ATTENDANCE REQUIREMENTS: Class meetings are an important part of this course, and students are expected to attend all classes. Excessive absences will lead to a lower grade and may lead to expulsion from the course. I call your attention to the college policy on class attendance in the *Course of Study*:

> "Absences for reasons of illness are not ordinarily excused: only when a student is declared by the College physician to be infirm (in a hospital or at home) will a health report be sent from the Health and Counseling Center to the dean of students, giving the days when each patient is judged infirm and recommending that the student's class absences be excused."

ONLY the Dean of Students (NOT the instructor) offers an Excused Absence. If you miss an in-class quiz or exam due to severe illness or emergency, your name must appear on the Dean of Students' ***Excused Absence List*** in order to make up the work; otherwise a failing grade will be given. In the event of an absence from class, the student is responsible for securing any notes, handouts or announcements from the class.

Student-Athletes: I call your attention to the college policy on class attendance in the *Scheduling Guidelines for Athletic Contests* (http://www.kenyon.edu/PreBuilt/provCASatleticsgl.doc). By the end of the first week of classes, you should notify the professor of all known athletic conflicts, which should not exceed 10% of our semester meeting times (4 classes).

C. CLASSROOM ETIQUETTE: ***Personal computers are not allowed in the classroom***. To maintain a respectful learning environment, please ***turn off cell phones***. Because of the room arrangement and capacity, please ***be on time*** and ***refrain from leaving*** during class, if possible.

D. ACADEMIC STANDARDS and HONESTY: I call to your attention the college policy on Maintenance of Academic Standards and Academic Honesty in the *Course of Study*. I am required to send progress reports for students performing below a grade level of C.

E. STUDENTS WITH DISABILITIES: If you have a physical, psychological, medical or learning disability that may impact your ability to carry out assigned course work, I urge you to contact the Office of Disability Services. The Coordinator of Disability Services, Erin Salva

(salvae@kenyon.edu; X5453), will review your concerns and determine with you what accommodations are appropriate. ONLY the Coordinator of Disability Services can approve accommodations for this course, but please feel free to discuss your concerns in private with me. All information and documentation of disability is confidential.

VI. STUDYING and OUT-OF-CLASS ASSISTANCE

Students are expected to study class notes, read assigned texts, work on homework problems and discuss chemistry with classmates and the instructor outside of the regular meeting time. You should be studying ~7–9 hours a week outside of class for a ½ credit course. In addition, I recommend that you study throughout the week, and not just before an exam or quiz. My primary goal is to help you to learn how to teach yourself, so meeting with me will be most productive when you have already put significant effort into your studies.

I am available to meet with students throughout the week, and encourage you to come to discuss your studies with me during regular office hours (*TBA*) or by appointment or chance. My full schedule with office hours is available at http://chemistry.kenyon.edu/cummings/schedule.htm. *Peer tutors* are available in *The Math and Science Skills Center* to assist you as you work to improve problem-solving, QR and chemistry skills, work on problem sets, and prepare for quizzes and exams. The Center (located in Tomsich 207) is open for nine hours each week, on Sundays, Tuesdays and Thursdays from 7–10 pm. *Weekly help sessions* will be offered; times and locations TBA.

VII. ASSESSMENT

A. HOMEWORK & QUIZZES: **Reading assignments** will be offered for each topic, and students are encouraged to complete reading assignments during the week we discuss the topic in class. A weekly **online quiz** (available on the Moodle site), covering core concepts, should be completed by 10 am the following Monday. **Problem sets**, involving chemistry calculations and critical assessment of topics covered in the reading or class discussion, will be assigned when we begin each topic and should be completed within one week. Although these weekly problem sets can be worked on individually or in study groups, every student is expected to understand how to solve the problems on their own. You are encouraged to seek assistance from the instructor or peer tutors, and can check your answers from either. I do not publically post answers to problem sets. *Why not?* In my experience, this too often short-circuits student learning. Reading someone else's answer is not the same as working to derive your own. We learn more from our mistakes than from others' answers. Problem sets will not normally be collected or graded. Instead, an **in-class quiz** consisting of one or two of the problems will be given most weeks (usually in class on the following Wednesday) and graded. Bring a pencil and calculator to every class. *If you cannot attend class when a quiz is offered, please do not contact the instructor;* only the Dean of Students offers an Excused Absence *(see attendance policy above).*

B. EXAMINATIONS: Three exams are scheduled for the semester: 50-minute midterm exams on **Monday, February 25** and **Friday, April 26** and a final exam on **May 9 from 6:30-9:30 p.m.**, as scheduled by the Registrar. *Please note these dates and times and do not plan travel on these days; no alternate exam times can be offered.* All exams are cumulative in coverage.

C. COURSE GRADES: Grades earned for each assessment category below determines the course grade:

quizzes:	200 points total
midterm exam #1:	200 points
midterm exam #2:	200 points
final exam:	400 points

Letter grades for the course are: A^-/A (900–1000 points), B^-/B/B^+ (800–899 points), C^-/C/C^+ (700–799 points), D^-/D/D^+ (500–699 points), F (below 500 points).

This course cannot be taken as "Pass/D/Fail".

D. GRADING PHILOSOPHY AND METHODS: Grades serve two purposes: to provide feedback to students (formative evaluation) and to evaluate student work to determine a course grade (summative evaluation). Using quizzes and exams, I aim to assess various aspects of student academic work: critical reasoning, quantitative reasoning, knowing basic information, recognizing concepts and themes, thinking by analogy, learning from previous mistakes, and demonstrating a commitment to improvement.

What is the format of assessment?
For practical and pedagogical reasons, assessment of the knowledge you gain in this course is based on in-class exams and quizzes that test your ability to identify core concepts, solve problems and demonstrate understanding <u>within a limited (but reasonable) amount of time</u>. This is an important skill in many facets of education and life. In other college courses, assessment tools such as term papers and projects may involve larger amounts of time and exercise a complementary set of skills. Both approaches have value.

Exams typically will include some very basic questions (that I anticipate nearly all students will be able to answer correctly), several standard questions (that should be familiar to students who have completed reading assignments and worked on problem sets), and one challenge problem (that I anticipate very few students will be able to answer correctly).

How is student work graded?
For individual questions and total exams and quizzes, points are earned for correct answers and approach to solving quantitative questions and insight and reasoning for qualitative questions:

numeric grade	letter grade	quality of work
90-100%	A	completely correct answer and approach
80-89%	B	sound approach to problem solving and demonstrated understanding of fundamental concepts, but with some mistakes
70-79%	C	adequate attempt, but misunderstanding of some key concept
50-69%	D	inability to solve problem
0-50%	F	didn't try (50% for missing a question completely; 0% for absence from class)

All work is evaluated on this absolute grading scale and is *NOT* graded "on a curve". You are not competing against each other for grades, so <u>you are encouraged to work with each other</u> in your studies.

What is the typical distribution of grades?
Although grades are not "curved", I anticipate that there will be a distribution of grades among students in this class. Students in most courses perform at a range of levels, typically a reflection of various factors: effort in the course, interest in the topic and commitment to succeed, preparation with pre-requisite knowledge and skills, and native abilities with the topic.

If I have designed my assessment tools effectively, then grades will reflect this spread in student performance: some *A* grades for outstanding work, *B* grades for work that shows a sound approach and solid understanding, *C* grades for work that is adequate, *D* grades for work that is deficient, and *F* grades for lack of effort or attendance. If everyone earns an *A* grade, then the exam or course was too easy; if everyone earns a *C or D* grade then the exam or course was too difficult. For a typical grade distribution, roughly half of the students earning grades that are "below average" and half of the students earning grades that are "above average".

As an example, here is a grade distribution for a CHEM 108 exam in a recent year: