

CHEMISTRY 125: NANOSCIENCE AND MATERIALS CHEMISTRY SPRING 2009 COURSE SYLLABUS

I. STUDENT LEARNING GOALS

(1) To understand the **chemical principles** underlying the topics of:

- thermochemistry,
- electrochemistry,
- molecular orbital theory,
- electronic and vibrational excited states,
- chemical kinetics,
- intermolecular forces, and
- solid-state bonding and electronic properties.

(2) To be able to apply this knowledge to a wide range of chemistry exercises in order to sharpen **problem-solving skills**. To accomplish this, student will:

1. **memorize** a core set of chemical terms, definitions and equations* (to be given);
2. **apply knowledge directly** to explain or predict the chemistry involved in examples from *nanoscience and materials chemistry*;
3. **transfer knowledge** by applying the core principles to understand *new and unfamiliar chemistry examples*;
4. **integrate knowledge** and skills from various topics to address examples that incorporate several different chemical principles;
5. **reason** by combining an understanding of the core principles with general *critical thinking* and *quantitative reasoning* skills to solving these problems.

(3) To recognize the application of this knowledge and these problem-solving methods to **important societal challenges and opportunities**.

II. INSTRUCTOR:

Prof. Scott D. Cummings Phone: PBX 5355 E-mail: cummings@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>

III. CLASS MEETING TIMES:

Chemistry 125 meets in Tomsich Hall 207 during period 2 (9:10-10).

IV. REQUIRED MATERIALS:

- *Chemical Principles* (5th edition) by Zumdahl
- a calculator – *bring to every class*

Important CHEM 125 course materials (schedule, reading assignments, weekly problem sets, some lecture slides, exam information) are available at: <http://moodle.kenyon.edu> (log in and select CHEM 125). These materials may not be distributed in class. Some class announcements may be made by email to your Kenyon account.

* "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)

V. COURSE and COLLEGE POLICIES

A. PRE-REQUISITES:

The material covered in first semester introductory chemistry (CHEM 121 or 122) is a prerequisite for this course. Much of what we cover will review and build upon the principles of the first semester courses, and exams and quizzes coverage will assume an understanding of material from the first semester. In addition, CHEM 126.04 lab is a *suggested* co-requisite.

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 a quiz or in-class 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, please notify the professor all potential athletic conflicts, which should not exceed 10% of our semester meeting times (4 classes).

C. CLASSROOM ETIQUETTE:

To maintain a respectful learning environment, please **turn off cell phones** and **disconnect all internet access**. Because of the room arrangement and capacity, please **be on time to class** and **refrain from leaving the room** 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. I run this and all my courses with the assumption of complete academic honesty by all students.

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 at 5453. The Coordinator of Disability Services, Erin Salva (salvae@kenyon.edu), will review your concerns and determine with you what accommodations are appropriate. ONLY the Coordinator of Disability Services can make accommodations, 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 read the textbook, study lecture notes, 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. The introductory chemistry sequence is cumulative, so you must retain your command of the material throughout the year. You are in charge of learning the material that we cover, and I am here to assist you.

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 chemistry tutors are available at *The Math and Science Skills Center* to assist you as you work to improve problem-solving and chemistry skills, work on problem sets, and prepare for quizzes and exams. The Center (in Tomsich 207) is open for ten hours each week, on Sundays (7-9 pm), Tuesdays (11am-1pm & 7-9 pm) and Thursdays (11am-1pm & 7-9 pm).

VII. ASSIGNMENTS and ASSESSMENT

Our exploration of each topic in the course will take approximately one week and involve a **reading assignment, quiz and problem set** - all available on the CHEM 125 Moodle website. Typically, students will be expected to complete the reading assignment over the weekend and take a quiz on basic concepts before class on Monday. We will then study the topic in more depth during the weekly classes, while you work on an associated problem set outside of class.

A. QUIZZES:

An online (Moodle) quiz will be available to take over the weekend. This is to be worked on individually and without the use of any other materials *after completing the assigned reading*, and is intended to take less than 15 minutes. The quiz will test basic understanding of important concepts from the assigned reading, but may also ask questions from any previous topics or material from the first semester.

B. PROBLEM SETS

A problem set involving more advanced problems will be due each Friday. You are encouraged to work with other students on this homework, but please recognize the difference between working with each other and copying from each other. Each student must submit answers to problem sets, which will be graded. Some exam questions will draw directly from problem sets.

C. EXAMINATIONS:

Five exams are scheduled: in-class mid-term exams on **Feb. 6 (“mini”)**, **Feb. 27 (“major”)**, **April 6 (“mini”)** and **April 20 (“major”)** and a final exam on **May 5** from 6:30-9:30 PM (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.

D. COURSE GRADES:

Grades earned for each assessment category below (along with an evaluation of class attendance and participation in class discussions, office hours and review sessions) determines the course grade:

QUIZZES	10%
PROBLEM SETS:	20%
MID-TERM EXAMS:	40%
FINAL EXAM:	30%

Letter grades for the course are: A⁻/A (90-100 %), B⁻/B/B⁺ (80-89 %), C⁻/C/C⁺ (70-79 %), D⁻/D/D⁺ (50-69 %), F (below 50 %).

E. 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 within a limited (but reasonable) amount of time.

Exams will typically 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	correct answer (with appropriate significant figures for numeric answers) and approach
80-89%	B	sound approach to problem solving and demonstrated understanding of fundamental concepts, 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 you are encouraged to work with each other in your studies.

What is the typical distribution of grades?

Although grades are not "curved", there will be a distribution of grades among students in the 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 truly 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".