

# Syllabus for INTRODUCTORY CHEMISTRY I (Chem 121) Fall 2009

See course Moodle page for updates: <https://moodle.kenyon.edu/course/view.php?id=3784>

This course provides a thorough introduction to the fundamental concepts, theories, and methodologies of chemistry. Topics will include stoichiometry, theories of molecular structure and bonding, the periodic table, acid-base chemistry, chemical equilibria, and thermodynamics. This course provides a basis for the further study of chemistry. The format is lecture and discussion.

## INSTRUCTOR:

Professor James S. Keller  
Tomsich 210 PBX: 5357  
e-mail: [kellerj@kenyon.edu](mailto:kellerj@kenyon.edu)

## OFFICE HOURS:

Mondays 10am-noon;  
Wednesdays 10-11am; and  
Thursdays 4–6 pm  
or by appointment (e-mail preferred)

## LECTURES:

9:10 - 10:00 am MWF (Period 2)  
in Tomsich 101 (York Lecture Hall)

## TEXTBOOK:

CHEMISTRY (9<sup>th</sup> Edition) by R. Chang

---

## LECTURE TOPICS (Chapter/Section)

### 2. Atoms, Molecules, and Ions

1. The Atomic Theory
2. The Structure of the Atom
3. Atomic Number, Mass Number, Isotopes
4. The Periodic Table
5. Molecules and Ions
6. Chemical Formulas

### 3. Mass Relationships in Chemical Reactions

1. Atomic Mass
2. Avogadro's Number & Molar Mass
3. Molecular Mass
5. Percent Composition of Compounds
6. Determination of Empirical Formulas
7. Chemical Rxns & Chemical Equations
8. Amounts of Reactants & Products
9. Limiting Reagents

### 6. Thermochemistry

1. Nature of Energy
2. Energy Changes in Chemical Rxns
3. Introduction to Thermodynamics
4. Enthalpy in Chemical Rxns
6. Standard Enthalpy of Formation & Rx

### 4. Reactions in Aqueous Solutions

1. General Properties of Aqueous Solutions
2. Precipitation Reactions
3. Acid-Base Reactions
4. Oxidation-Reduction Reactions

### 7. Quantum Theory / Electronic Structure

1. From Classical Physics to Quantum
2. The Photoelectric Effect
3. Bohr's Theory of the Hydrogen Atom
4. The Dual Nature of the Electron
5. Quantum Mechanics
6. Quantum Numbers
7. Atomic Orbitals
8. Electron Configuration
9. The Building-Up Principle

### 8. Periodic Relationships Among Elements

1. Development of the Periodic Table
2. Periodic Classification of the Elements
3. Periodic Variation in Physical Properties
4. Ionization Energy
5. Electron Affinity

### 9. Chemical Bonding I: Basic Concepts

1. Lewis Dot Symbols
2. The Ionic Bond
4. The Covalent Bond
5. Electronegativity
6. Writing Lewis Structures
7. Formal Charge and Lewis Structure
9. Exceptions to the Octet Rule

### 10. Chemical Bonding II: Molecular Geometry

1. Molecular Geometry
2. Dipole Moment
3. Valence Bond Theory
4. Hybridization of Atomic Orbitals
5. Hybridization of Molecules
6. Molecular Orbital Theory
7. Molecular Orbital Configurations

### 14. Chemical Equilibrium

1. Concept of Equilibrium
2. Equilibrium Constant Expressions
3. Relationship b/w Kinetics & Equilibrium
4. What Does the Equil Constant Tell Us
5. Factors that Affect Equilibrium

### 15. Acids and Bases

1. Bronsted Acids and Bases
2. The Acid-Base Properties of Water
3. pH—A measure of Acidity
4. Strength of Acids and Bases
5. Weak Acids & Acid Ionization Constants
6. Weak Bases & Base Ionization Constants
7. Acids and Their Conjugate Bases
10. Acid-Base Properties of Salts

## COURSE REQUIREMENTS:

### A. Prerequisites

No prerequisite course. If you have not already, please complete the Chemistry Placement Survey. The chemistry department uses this 20-minute survey/quiz to appropriately place students in the introductory course that best matches their chemistry background and demonstrated skills. We also track performance against this metric.

### B. Lecture attendance

Lectures are an essential part of this course. You are expected to make every effort to attend **all** lectures. Excessive absences will lead to a lower grade and may lead to expulsion from the course. Please inform me if you must miss a class, and make arrangements to stay current with the material.

### C. Homework

Four sets of homework problems will be assigned during the semester. These homework sets are to be turned in at the start of the Friday class following their distribution. They will be graded and a significant penalty will apply to late problem sets (10% deduction per day). The homework component of your course grade will consist of these four problem sets; however, additional assigned problems (for self-study) will be made regularly. I **strongly encourage** students to work in small groups and/or consult with me on these problems; however, I expect everyone to make a serious attempt to work the problems individually before consulting others.

### D. Quizzes

A series of on-line quizzes will be administered starting the second week of classes. These “daily” quizzes will help you test your reading of the material and give me feedback on your grasp of new concepts. Grading will be participation-based; nevertheless, a serious effort is expected on these assignments. Details of the location of the quizzes and submission instructions will be discussed in class.

### E. Exams

Four midterm exams will be given during the semester on the following Fridays: **September 25, October 23, November 13, and December 11**. They will be administered during the regularly scheduled class time for those dates. Topics to be covered and review sessions will be discussed before each exam. A comprehensive, final examination will be given on **Sunday, December 20** from **8:30 - 11:30 am**. This time can only be rescheduled with the permission of the Associate Provost. Plan accordingly.

## GRADING:

Your grade will be based on the following distribution:

Homework sets:	15%
Midterm exams:	40%
Final exam:	30%
Online participation	10%
Independent project	5%

A: excellent work. Mistakes are rare. Unusually good effort.

B: very good work. Some mistakes, but the major concepts are well understood. Good effort.

C: good work. Small mistakes are common, but the major concepts are understood. Good effort.

D: poor work. Major conceptual mistakes. Effort is not enough.

F: unacceptable work. Major conceptual mistakes are common. Effort is minimal.

## COLLEGE POLICIES:

### A. Academic Honesty

Please read (or reread) the College policy on Academic Honesty in the 2009-2010 Course of Study ([http://documents.kenyon.edu/courses//2009\\_2010/honesty.pdf](http://documents.kenyon.edu/courses//2009_2010/honesty.pdf)). Examinations are to be taken without the aid of notes or your fellow students. On-line quizzes are to be taken individually and should represent your understanding of the material. Homework sets cannot be copied. Acknowledgement of outside sources is expected where appropriate. Feel free to discuss with me how any aspect of Academic Honesty applies to this course.

### B. 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 would urge you to contact the Office of Disability Services at x5453. The Coordinator of Disability Services, Erin Salva ([salvae@kenyon.edu](mailto:salvae@kenyon.edu)) will review your concerns and determine, with you, what accommodations are appropriate (*e.g.*, additional time for exams). Only the Coordinator of Disability Services can make recommendations, but please feel free to discuss your concerns in private with me. All information and documentation of disability is kept confidential.

### C. Athletics and Extra-curricular Activities

If your participation in athletics or extra-curricular activities conflicts with a class, scheduled exam time or project due date, please let me know as soon as possible, but at least two weeks in advance. Typically you will be expected to complete your work **before** (not after) the deadline for the rest of the class. Plan accordingly.

### D. H1N1 virus

As expected, the H1N1 flu virus has become a reality on Kenyon's campus. The H1N1 virus is highly contagious, and it is likely that more cases will develop at the College. We urge anyone who develops a sudden fever or flu-like symptoms to avoid contact with people. Students with flu-like symptoms should stay in their rooms and call the Health Center (after hours, call the campus switchboard). Do not visit the Health Center unless you are advised to do so.

- \* Wash your hands often with soap and water, especially after you cough or sneeze. Alcohol-based hand cleaners are also effective.

- \* Cover your nose and mouth with a tissue when you cough or sneeze. Throw the tissue in the trash.

- \* Avoid touching your eyes, nose or mouth

- \* Avoid close contact with sick people.

- \* Be aware of symptoms that include fever, cough, sore throat, runny or stuffy nose, body aches, headache, chills, and fatigue. Some people infected with this virus have also reported diarrhea and vomiting.

- \* If you are sick with flu-like illness, stay home at least 24 hours after the fever ends, except to get medical care or other necessities. Stay away from people and avoid public events. You may want to wear a face mask if you leave your residence or must interact with others. Face masks are available in the Health Center and will be available in the residence halls when the semester begins.

## Tentative Schedule

(Exam dates fixed. Content may change.)

<b>week/date</b>	<b>Monday</b>	<b>Wednesday</b>	<b>Friday</b>	
week 1 aug 31-sept 4	introduction	Ch 2/Ch 3 <b>(workshop THURSDAY 7pm)</b>	Ch 2/Ch 3	Ch 2 atoms, molecules & ions Ch 3 mass relationships
week 2 sept 7-11	Ch 2/Ch 3 <b>(workshop TUESDAY 6pm)</b>	Ch 2/Ch 3 <b>(workshop THURSDAY 6pm)</b>	Ch 6 <b>QUIZ</b>	Ch 6 thermochemistry
week 3 sept 14-18	Ch 6	Ch 6	Ch 6	
week 4 sept 21-25	Ch 4	Ch 4	<b>EXAM</b>	Ch 4 rxs in aqueous solutions
week 5 sept 28-oct 2	Ch 4	Ch 4	Ch 7	
week 6 oct 5-9	Ch 7	Ch 7	Ch 7	Ch 7 quantum theory
week 7 oct 12-16	<i>reading day</i>	Ch 7	Ch 7	
week 8 oct 19-23	Ch 8	Ch 9	<b>EXAM</b>	Ch 8 periodic relationships
week 9 oct 26-30	Ch 9	Ch 9	Ch 9	Ch 9 chemical bonding
week 10 nov 2-nov 6	Ch 9	Ch 10	Ch 10	
week 11 nov 9-13	Ch 10	Ch 10	<b>EXAM</b>	Ch 10 molecular geometry
week 12 nov 16-20	Ch 10	Ch 14	Ch 14	
<b>THANKSGIVING BREAK</b>				
week 13 nov 30-dec 4	Ch 14	Ch 15	Ch 15	Ch 14 chemical equilibrium
week 14 dec 7-11	Ch 15	Ch 15	<b>EXAM</b>	
week 15 dec 14	review			Ch 15 acids and bases

*Expect a homework assignment due one week before each exam.  
Practice exercises and review sessions will be organized for exam weeks.*

### Workshops

There will be three workshops at the beginning of the term designed to review material normally covered in high school (**Ch 1, 2, 3**, and section **4.5** of the text). Each workshop will include a short review of the topics and provide time for you to work through selected problems. All workshops will be held at Tomsich 101.