



East China Normal University International Summer Session

CHE 13 General Chemistry I

Term: July 5th –August 8th, 2018

Instructor: James Doyle

Home Institution: Macalester College

Office hours: 11:30 – 12:30 MTWThF

Email: doyle@macalester.edu

Teaching Assistant: TBD

Course Description

This course is a college level introduction to the fundamental principles of chemistry. Topics include basic chemical principles, chemical reactions and stoichiometry, reactions in solution, thermochemistry, and atomic structure and molecular bonding, and properties of gases and solutions. In addition to the chemistry content knowledge students will develop quantitative problem solving skills, critical thinking skills, and in the laboratory part of the course experimental and data analysis skills. Students are expected to have competency in basic algebra.

Course Overview

As our textbook claims, chemistry is indeed “The Central Science”! In this course students will learn the basic principles of modern chemistry and how they apply to the physical world. The course is foundational to future studies in chemistry and the material is highly relevant to multiple areas such as biology, medicine, geology, environmental science, materials science, and many other areas of science and technology. The key to mastering the ideas of chemistry is to *engage in quantitative problem solving*. Effective problem solving consists of understanding the underlying background material and theory, study of examples where the theory is applied paying careful attention to common strategies and approaches, and finally applying these approaches to problems that you have not encountered before. You will find that your problem solving skills will improve immensely with experience.

But it is also important to remember that chemistry is an *experimental science* and its fundamental principles are based on *empirical observations and careful experiment*. Thus, in this course the essential ideas of chemistry will be explored and reinforced in a series of laboratory exercises, with the goal of understanding the nature of measurement, experiment, and the scientific method.



Course Goals:

A student who satisfactorily completes this course should:

1. Be familiar with the content, methods, and applications of chemistry that apply to the physical world.
2. To understand how the atomic theory of matter provides the foundation for the richness and variety of chemical phenomena.
3. To understand the fundamental principles of molecular bonding and structure, chemical reaction stoichiometry, application of thermodynamics to chemical reactions, the properties of solutions and solution chemistry, and properties of gases and liquids.
4. To understand the nature of the scientific method and scientific reasoning as applied to chemistry
5. To develop proficiency in quantitative problem solving, data analysis and interpretation, and critical thinking skills.

Required Text

The textbook *Chemistry: The Central Science (14th Edition)* by Brown, LeMay, Bursten, Murphy, Woodward, and Stoltzfus is required. The text is available as an eTextbook from Amazon.com (ISBN-13: 978-0134414232, ISBN-10: 0134414233).

The lab manual for the laboratories will be provided on the first day of class. Students should purchase inexpensive bound notebook (at least 50 pages) to serve as a *dedicated* laboratory notebook.

Course Hours

The course has 25 class sessions in total. Each class session is 110 minutes in length, for a total of 2750 minutes of in-class time. The course meets from Monday to Friday from July 5 to August 8. ECNU awards 4 credits for this course. Different universities may count course credits differently. Consult officials at your own home institution.

Attendance

Summer school is very intense and to be successful, students need to attend every class. Occasionally, due to illness or other unavoidable circumstance, a student may need to miss a class. ECNU policy requires a medical certificate to be excused. Any absence may impact on the student's grade. Moreover, **ECNU policy is that a student who has more than 3 absences will fail the course. Arriving late or leaving early will count as a partial absence.**

Grading Policy

ECNU awards grades of A, A-, B+, B, B-, C+, D, and F. Most colleges and universities do not award transfer credit for grades of D or F.



In this course, grading will be based on the following:

Midterm Exam	20%
Final Exam	30%
Homework	20%
Laboratory	20%
Reading Quizzes/Discussion	10%

Every non-lab class will begin with a short (~ 5 min) reading quiz followed by a short class discussion to cover the general ideas and “big picture” in the reading. Since the quizzes will be given at the beginning of class, you must arrive at class on time. Your two lowest quiz scores will be dropped. *Missed quizzes cannot be made up.*

There will be 15 Homework assignments each consisting of approximately 10-12 exercises problems each from the textbook. Homework is due at the beginning of class on the due date. You can work together on the homework, but the submitted work must be your own. There will also be some Review Problems assigned for exam review, but these will not be submitted for grading. Students are expected to work Review Problems in preparation for the exams just as if they were assigned homework problems. Solutions to all assigned problems will be posted after the due date.

For the laboratory assignments you will submit your laboratory notebook for grading at the beginning of the next class period.

General expectations:

Students are expected to:

- Attend all classes and be responsible for all material covered in class and otherwise assigned. Any unexcused absence may impact a student's grade. Moreover, ECNU policy is that a student who has more than 3 absences will fail the course. Arriving late or leaving early will count as a partial absence.
- Complete the day's required reading and assignments before class
- Review the previous day's notes before class; make notes about questions you have about the previous class or the day's reading
- Participate in class discussions and complete required written work on time.
- Refrain from texting, phoning or engaging in computer activities unrelated to class during class. Students who do not do this will be asked to leave the class
- While class participation is welcome, even required, you are expected to refrain from private conversations during the class period.



Course Schedules

<u>DATE</u>	<u>TOPIC</u>	<u>READING</u>
WEEK ONE:		
7/5	Thurs: Introduction: Matter and Measurement	Chapter 1 pp. 4 – 24
7/6	Fri: Lab 1: Introduction to Lab and Measurement	Chapter 1 pp. 24 – 33
WEEK TWO:		
7/9	Mon: Atoms, Molecules and Ions	Chapter 2 pp 44-58
7/10	Tues: Atoms/Reactions and Stoichiometry	Chapter 2 pp 58-72 Chapter 3 pp 84-93
7/11	Wed: Stoichiometry/Reactions in Aqueous Solution	Chapter 3 pp 93-110
7/12	Thurs: Lab 2: Precipitation Reactions and Stoichiometry	
7/13	Fri: Reactions in Aqueous Solution	Chapter 4 pp. 120-137
WEEK THREE:		
7/16	Mon: Lab 3: Titrations and Redox Reactions	Chapter 4 pp. 137-153
7/17	Tues: Thermochemistry	Chapter 5 pp. 162-183
7/18	Wed: Thermochemistry/Midterm Review	Chapter 5 pp. 183-200
7/19	Thurs: Lab 4: Calorimetry	
7/20	Fri: Midterm (1 hr, Chapters 1-5)/Electronic Structure	
WEEK FOUR:		
7/23	Mon: Electronic Structure of Atoms	Chapter 6 pp. 214-234
7/24	Tues: Electronic Structure/Periodic Table	Chapter 6 pp. 234-246 Chapter 7 pp. 256-268
7/25	Wed: Periodic Table/Chemical Bonding	Chapter 7 pp. 268-288 Chapter 8 pp. 298-309
7/26	Thurs: Lab 5 Periodic Trends in Reactivity	
7/27	Fri: Chemical Bonding	Chapter 8 pp. 309-328
WEEK FIVE:		
7/30	Mon: Molecular Geometry	Chapter 9 pp. 340-322
7/31	Tues: Molecular Geometry/Properties of Gases	Chapter 9 pp. 361-382 Chapter 10 pp. 396-412
8/01	Wed: Lab 6: Molecular Structure Calculations	
8/02	Thurs: Properties of Gases/Intermolecular Forces	Chapter 10 pp. 412-423



8/03 Fri: Intermolecular Forces/Solutions

Chapter 11 pp. 434-449
Chapter 11 pp. 449-462
Chapter 13 pp. 526-538

WEEK SIX:

8/06 Mon: Solutions/Final Exam Review

Chapter 13 pp. 538-552

8/07 Tues: Lab 7 Vapor Pressure

8/08 Wed: Final Exam (110 min)

Academic Honesty

Students are expected to maintain high standards of academic honesty. Specifically, unless otherwise directed by the professor, students may not consult other students, books, notes, electronic devices or any other source, on examinations. Failure to abide by this may result in a zero on the examination, or even failure in the course