

CHEM 101-004 (-005, -006): General Chemistry – Semester 1
Fall 2018
Loyola University Chicago

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Office hours: Tuesdays, 1:30 – 3:00 pm Wednesdays, 1:30 – 3:00 pm
STEM Resource Center STEM Resource Center
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Sessions begin on Tuesday, September 4	STEM Resource Center	STEM Resource Center, Room 1 Mondays, 7:00-8:00 pm Tuesdays, 4:00-5:00 pm Wednesdays, 8:00-9:00 pm

Class Meeting Times: Lecture: Tuesday and Thursday 10:00 – 11:15 am, Cuneo Hall, Room 210
Discussion: 005: Thursday, 11:30 am – 12:20 pm, Flanner Hall, Room 07
Discussion: 006: Thursday, 2:30 – 3:20 pm, Flanner Hall, Room 07

Course Description

This course is the first in a two-semester sequence of general chemistry. We will focus on building a conceptual understanding of fundamental chemical principles including properties of atoms, molecules, states of matter, and chemical reactions. Students will learn the language of chemistry and develop their skills in scientific problem solving and critical thinking. This will serve as a foundation for further study in chemistry, other sciences and related disciplines.

- Differentiate types of matter based on their chemical and physical properties (for example, pure substances vs. mixtures, metals vs. nonmetals, ionic vs. covalent vs. metallic, electrolyte vs. nonelectrolyte).
- Use multiple perspectives of matter (macroscopic, particle, symbolic levels) to qualitatively describe and explain characteristics, properties, and relationships of the following: atomic structure, nuclear chemistry, periodicity, molecular structure, chemical bonding, chemical reactions, thermochemistry, aqueous solutions, gases.
- Quantify relationships between variables controlling chemical systems.
- Solve quantitative multistep problems combining multiple concepts within the systems.
- Differentiate among closely related factors, categorize problem types, and select appropriate tools to solve these problems.
- Apply chemical principles to explain natural phenomena.

Prerequisites:

Satisfactory performance on the Loyola math proficiency test or Math 117 (or equivalent) with a grade of C- or better. A year of high school chemistry is recommended.

Required Resources

- (1) Brown, LeMay, Bursten, Murphy, Woodward, Stoltzfus (2015). *Chemistry: The Central Science (with MasteringChemistry)*, 14th ed. Pearson Prentice Hall. ISBN 978-0-134-29281-6 (may vary with format). Any format is acceptable (print, loose pages, or e-text). The *MasteringChemistry* website will be used for homework and quizzes. The course ID for this course is: **BRAZDIL101FA18**
- (2) Moog, R.S. & Farrell, J.J. (2015). *Chemistry: A Guided Inquiry*, 7th Edition. ISBN: Print: 978-1-119-11070-5 or eText: 978-1-119-29950-9)
- (3) *Sakai Connection*, sakai.luc.edu – the course is: **CHEM 101 004 F18**
This syllabus will be posted to Sakai. Materials such as videos or Voice Threads for assignments along with other useful information, including optional supports, will be posted under the Resources section of Sakai. Assignments with due dates will be posted under Assignments (most of these will actually be completed on *MasteringChemistry*). Grades also will be posted to Sakai. The instructor will monitor your progress in order to ask questions or provide suggestions to make sure you are learning important concepts in chemistry.

Course Objectives

The emphasis of this course is on understanding, application, and prediction rather than memorization. This means that students must foster their problem solving skills and their ability to make claims based on evidence. It is not enough to know *what* happens in chemistry, students must also be able to explain *why* it happens.

Within various measures for student growth at Loyola this course aims to help the student in the following areas:

- *Essential Components of the Course (IDEA Objectives)*. *This course aims to help students:*
 - Gain a basic understanding of chemistry (e.g., factual knowledge, methods, principles, generalizations, theories).
 - Learn to *apply* course material (to improve thinking, problem solving, and decisions).
 - Develop specific skills, competencies, and points of view needed by professionals in the field most closely related to this course
 - Gain a broader understanding and appreciation of the intellectual/cultural activity of science.

- *Connection to the “Hungers” of Loyola University’s Transformative Education*
Within the spirit of Jesuit education traditions and practices, this course seeks to assist each student in fostering hungers associated with the University’s model of transformative education.¹ The study of introductory chemistry can also assist in development of the specific hungers below:
 - A Hunger for Integrated Knowledge – by building an understanding of a variety of chemical concepts and applying them to problems in many contexts.
 - A Hunger for a Moral Compass – by examining the variables, benefits, and detriments that exist at the interface of applied science, technology, environment, and society.
 - A Hunger for a Global Paradigm – by examining the variables, benefits, and detriments that exist at the interface of applied science, technology, environment, and society.

Instructional Format

This course will not follow a traditional lecture format for delivery of course content and skill development. While there may be some lectures, the course will focus more on eliciting students’ current ideas and thoughts about sets of data or presented models. Then, through guided questions about the presented information, students, in small groups, discuss ideas and come to consensus about answers to questions. Ideas are further developed in questions that force application of the agreed upon concepts. The instructor is the guide on this journey, pointing out areas that are particularly relevant or that may need attention. This format is designed based on the idea that learning cannot be directly transmitted from one person to another. Knowledge must be built by the learner which results from interpretation and reflection on experiences in particular contexts, such as the chemistry classroom, when working with others and guided by a mentor.

Course Repeat Rule

Effective with the Fall 2017 semester, students are allowed only THREE attempts to pass Chemistry courses with a C- or better grade. The three attempts include withdrawals (W). After the second attempt, the student must secure approval for a third attempt. Students must come to the Chemistry Department, fill out a permission to register form or print it from the Department of Chemistry & Biochemistry website: <http://www.luc.edu/chemistry/forms/> and personally meet and obtain a signature from either the Undergraduate Program Director, Assistant Chairperson, or Chairperson in Chemistry. A copy of this form is then taken to your Academic Advisor in Sullivan to secure final permission for the attempt.

¹<http://www.luc.edu/transformatived/>

Academic Integrity

All students in this course are expected to have read and to abide by the demanding standard of personal honesty, drafted by the College of Arts & Sciences, which can be viewed at:

<http://www.luc.edu/cas/advising/academicintegritystatement/>

A basic mission of a university is to search for and to communicate the truth as it is honestly perceived. A genuine learning community cannot exist unless this demanding standard is a fundamental tenet of the intellectual life of the community. Students of Loyola University Chicago are expected to know, to respect, and to practice this standard of personal honesty.

Academic dishonesty can take several forms, including, but not limited to cheating, plagiarism, copying another student's work, and submitting false documents.

Any instance of dishonesty (including those detailed on the website provided above or in this syllabus) will be reported to The Chair of The Department of Chemistry & Biochemistry who will decide what the next steps may be.

Anything you submit that is incorporated as part of your grade in this course (*e.g.*, quiz, examination, homework, paper, presentation) must represent your own work. Any student found to have cheated on, plagiarized, fabricated, or falsified any portion of a test or assignment will receive a zero on that test or assignment and this grade cannot be dropped. The student has the right to appeal the instructor's decision. If the student does so, the Academic Grievance Procedure described at https://www.luc.edu/academics/catalog/undergrad/reg_academicgrievance.shtml will be followed. If a student is found to have cheated on, plagiarized, fabricated, or falsified any portion of a test or assignment for a second time in this class, they will receive an F for the class. In all cases of academic dishonesty, the instructor will report the incident to the Office of the CAS Dean. Depending on the seriousness of the incident, additional sanctions may be imposed.

Students with Disabilities

If you have any special needs, please let me know in the first week of classes. The university provides services for students with disabilities. Any student who would like to use any of these university services should contact the Services for Students with Disabilities (SSWD), Sullivan Center, (773) 508-3700. Further information is available at <http://www.luc.edu/sswd/>.

Harassment (Bias Reporting)

It is unacceptable and a violation of university policy to harass, discriminate against or abuse any person because of his or her race, color, national origin, gender, sexual orientation, disability, religion, age or any other characteristic protected by applicable law. Such behavior threatens to destroy the environment of tolerance and mutual respect that must prevail for this university to fulfill its educational and health care mission. For this reason, every incident of harassment, discrimination or abuse undermines the aspirations and attacks the ideals of our community. The university qualifies these incidents as incidents of bias.

In order to uphold our mission of being Chicago's Jesuit Catholic University-- a diverse community seeking God in all things and working to expand knowledge in the service of humanity through learning, justice and faith, any incident(s) of bias must be reported and appropriately addressed.

Loyola University Absence Policy for Students in Co-Curricular Activities:

Students missing classes while representing Loyola University Chicago in an official capacity (e.g. intercollegiate athletics, debate team, model government organization) shall be allowed by the faculty member of record to make up any assignments and to receive notes or other written information distributed in the missed classes.

Students should discuss with faculty the potential consequences of missing lectures and the ways in which they can be remedied. Students must provide their instructors with proper documentation (develop standard form on web) describing the reason for and date of the absence.

This documentation must be signed by an appropriate faculty or staff member, and it must be provided as far in advance of the absence as possible. It is the responsibility of the student to make up any assignments. If the student misses an examination, the instructor is required to give the student the opportunity to take the examination at another time.

<https://www.luc.edu/athleteadvising/attendance.shtml>

Course Evaluation

Grades will be assigned in the course according to the following sources:

Table 1. Grade Criteria

Criteria	Maximum Percent Value
Participation and group responses	10%
Online homework sets	10%
Quizzes	5%
Tests	45%
Final Exam	30%

Participation and group responses will be an important part of the class. This work will be a combination of individual and group work. Students must be present during class sessions, including discussion sections, in order to receive credit for these assignments. Participation involves completing assignments and using pertinent data to take part in group work, add to discussions, and make reasoned conclusions or decisions. This will include being able to ask questions of others and to evaluate arguments and conclusions made by others.

Online quizzes will be administered via *MasteringChemistry* on Thursday of each week starting in the second week of class, except during weeks in which there is a test. Quizzes will be open on *MasteringChemistry* from 3:30-11:55 pm on these days. Once you open the quiz, you will have 20 minutes to complete it. Content from the text as well as sessions from the previous week and, on rare occasions, from Tuesday's class as well will be the source of material on each quiz. The two lowest quiz scores will be dropped from your course evaluation.

Online Homework Sets using *MasteringChemistry* will be assigned each week. Submitted responses must be the result of your individual effort and synthesis and must be submitted by 11:55 pm Central Time each Tuesday. While you can work with classmates on homework, you need to ensure that you understand how to do the assigned problems so that you are able to do them without help from others. Short answers must be your own synthesis and represent your understanding of the question. Late assignments may not be accepted, and verification of reasons for late assignments may be requested. You are given up to four attempts to obtain correct

answers on online homework problems. Except in the case of multiple choice questions, no points will be deducted for incorrect attempts if you obtain the correct answer within the allotted four attempts.

Other Online Homework using *Sakai* and *MasteringChemistry* also will be assigned at times. These will often be Voice Threads or other materials to provide background for class or follow up information after class. These assignments will be shorter than the weekly homework sets. Due dates and times will be given in class and on *Sakai* and *MasteringChemistry*.

Tests will be administered at three different points during the course. Each will primarily reflect the content and concepts developed during prior class sessions but may integrate prior content as well.

The *Final Exam* will be designed to assess students comprehensive knowledge of concepts developed during the work of the semester.

The University sets the schedule for all final exams. **The final will be held on Tuesday, December 11, 2018, from 1:00-3:00 pm in Cuneo Hall, Room 210.** You will have exactly 2 hours to complete the exam. Additional time will not be granted, even if you arrive late. There will be no make-up final exams given under any circumstance, and the exam will not be given early, either. Instructors may not reschedule final exams for a class for another day and/or time during the final exam period. There can be no divergence from the posted schedule of dates for final exams.

Individual students who have four (4) final examinations scheduled for the same date may request to have one of those exams rescheduled. If a student reports having four final examinations scheduled for the same date, students should be directed to e-mail a petition to Lester Manzano, Assistant Dean for Student Academic Affairs, CAS Dean's Office (lmanzan@luc.edu).

Grades will be assigned according to the grading scale presented in Table 2.

Table 2: Grading Scale

Percentage of Points Earned	Grade
92% or greater	A
<92% - 90%	A-
<90% - 88%	B+
<88% - 82%	B
<82% - 80%	B-
<80% - 78%	C+
<78% - 72%	C
<72% - 70%	C-
<70% -68%	D+
<68% - 60%	D
<60%	F

Practices for Success

Supporting claims with evidence, making applications, solving and analyzing problems, and using scientific principles to explain phenomena are critical skills in the field of science. The development of these skills is not without some frustration, but it carries the reward of deepening one's ability to think critically and solve problems in any field. To do this, one may have to assess, evaluate, and possibly revise approaches to learning. The use of targeted, guiding questions, regularly scheduled work, and strategic study plans can greatly assist the learning of science. With such a focus, hopefully any frustration will quickly turn to appreciation and fascination for the relevance and connectedness of science in your life and the world around you. Solving and analyzing problems is the most important feature of this work. If, at any time, you need assistance framing such plans for your work in science, please do not hesitate to ask the instructor.

Norms of Course Proceedings

The classroom is to be a safe place to question and explore ideas. Student and teacher voices are important to this work. Collegial disagreement can be a healthy part of this process, but must always include respect for all members of the class.

Course activities will be designed to help students reach the goal of learning chemistry content and developing thinking skills. This will more often be driven by the use of data and reasoning to discover concepts and solutions rather than the identification and exchange of facts and algorithms.

Class sessions will begin and end on time. All students should attend class regularly, including discussion sections, and participate in class discussions. Multiple absences could affect one's ability to learn chemistry during this semester. Anticipated absences should be discussed with the instructor two class days before the absence. Proper documents may be requested to verify the reason for any absence. This is particularly relevant to days missed that include an in-class assessment for which a student is asking for a make-up.

Class time is designed to engage students in activities that advance their understanding of chemistry. Electronic media, including cell phone, texting devices, laptops, and tablets should be used only as they enhance the activity of the class. In general, cell phones and texting devices should be turned off during class time. If you expect that you might receive an emergency phone call or text during class, please set your phone so that it will not distract other participants in the course and sit in a place where you can easily step into the hallway to answer a call if necessary.

Email messages and other electronic communication among students in the course should be respectful, appropriate, and professional. The instructor will respond to emails and phone messages as quickly as possible and at a minimum within 24 hours except on weekends. Only emails from your Loyola University account will be accepted, and the instructor will only send emails to your Loyola University account. Communications received after 3:00 pm Central Time on Friday or over a weekend will be answered on Monday morning at the latest.

Completed course assignments must be submitted by the end of the day (11:55 pm Central Time) on the due date. Please note that the due date may or may not be a date that the class meets. Late assignments will not be accepted without proper verification of reasons.

Course Schedule and Assignments

The course will meet in accordance with the official Academic Calendar, which can be found at www.luc.edu/academics/schedules. Students should complete the Warm-up portions of the Chem Activities (CAs) BEFORE the date they will be completed in class and read the sections of BLBMWS AFTER the day they are listed. Generally, CA Critical Thinking Questions are completed during class. Exercise or Problems that are assigned as part of the Recorder's Report are also completed during class. You are encouraged to complete other Exercises or Problems to reinforce your understanding of the concepts.

Table 3. Proposed Semester Topics & Schedule

Dates	Topics
Week 1: August 27-31	Tuesday, August 28: Matter and Measurement (BLBMWS, Chapter 1 - review); The Nuclear Atom (Moog, CA 1; BLBMWS, Chapter 2, Sections 1-3)
	Thursday, August 31: Atomic Number & Atomic Mass (Moog, CA 2; BLBMWS, Chapter 2, Sections 3, 4)
Week 2: September 3-7	Tuesday, September 4: Coulombic Attractions (Moog, CA 3; BLBMWS, Chapter 2, Section 3, A Closer Look); Nuclear Chemistry (Supplemental CA 63; BLBMWS, Chapter 21, Sections 1-3)
	Thursday, September 6: Nuclear Chemistry (Supplemental CA 64; BLBMWS, Chapter 21, Sections 5-9)
Week 3: September 10-14	Tuesday, September 11: Electron Behavior and Periodic Properties (Moog, CA 4, 5; BLBMWS, Chapter 2, Section 5 and Chapter 7, Sections 1, 2, 4, 6)
	Thursday, September 13: Sizes of Atoms and Ions, Electromagnetic Radiation (Moog, CA 6, 7; BLBMWS, Chapter 6, Section 1; Chapter 7, Sections 3, 7, 8)
Week 4: September 17-21	Tuesday, September 18: Representations of Orbitals, Many-Electron Atoms, and Electronic Structure of Atoms (Moog, CA 8, 9; BLBMWS, Chapter 6, Sections 2-4, 6 (Orbitals and Their Energies))
	Thursday, September 20: Electron Configurations and the Periodic Table (Moog, CA 10; BLBMWS Chapter 6, Sections 8, 9)
Week 5: September 24-28	Tuesday, September 25: Electron Spin (Moog, CA 11; BLBMWS, Chapter 6, Section 7)
	Thursday, September 27: Exam 1 (Moog CAs 1-11, BLBMWS Chapter 1; Chapter 2, Sections 1-5; Chapter 6, Sections 1-4, 6-9; Chapter 7, Sections 1-4, 6-8; Chapter 21, Sections 1-3, 5-9)
Week 6: October 1-5	Tuesday, October 2: Covalent Bonding, Lewis Structures, Bond Order, and Bond Strength (Moog, CA 12, 13; BLBMWS, Chapter 2, Sections 6-9; Chapter 8, Sections 1, 3, 8)
	Thursday, October 4: Bond Order, Bond Strength, and Resonance Structures (Moog, CA 14; BLBMWS, Chapter 8, Sections 6, 8 (Bond Enthalpy and Bond Length))

Week 7: October 8-13	Tuesday, October 6: Fall Break
	Thursday, October 11: Lewis Structures, Formal Charge, and Exceptions to the Octet Rule (Moog, CA 15, 16; BLBMWS, Chapter 8, Sections 5, 7)
Week 8 October 15-19	Tuesday, October 16: Molecular Shapes and Hybrid Orbitals (Moog, CA 17, 18; BLBMWS, Chapter 9, Sections 1, 2, 4-6)
	Thursday, October 18: Polar, Nonpolar, and Ionic Bonds (Moog, CA 19; BLBMWS, Chapter 7, Section 5; Chapter 8, Sections 2, 4)
Week 9: October 22-26	Tuesday, October 23: Dipole Moment and Ionic Bonds (Moog, CA 21, 22; BLBMWS, Chapter 8, Sections 2, 4; Chapter 9, Section 3)
	Thursday, October 25: Exam 2 (Moog, CAs 12-19, 22; BLBMWS Chapter 2, Sections 6-9; Chapter 7, Section 1; Chapter 8 (except Bond Enthalpies and the Enthalpies of Reaction))
Week 10: October 29- November 2	Tuesday, October 30: General Properties of Aqueous Solutions and Metallic Bonding (Moog, CA 23; BLBMWS, Chapter 4, Section 1; Chapter 12, Sections 1, 4 (Electron Sea Model))
	Thursday, November 1: The Mole Concept and Chemical Equations (Moog, CA 26, 27; BLBMWS, Chapter 3, Section 1, 2, 4, 6)
Week 11: November 5-9	Tuesday, November 6: Limiting Reagents and Oxidation-Reduction Reactions (Moog, CA 28; BLBMWS, Chapter 3, Section 7; Chapter 4, Section 4 (not The Activity Series))
	Thursday, November 8: Empirical Formula (Moog, CA 29; BLBMWS, Chapter 3, Sections 3, 5)
Week 12: November 12-16	Tuesday, November 12: Solutions, Solution Stoichiometry, Acids, and Bases, and Molarity (Moog, CA 30; BLBMWS, Chapter 4, Sections 2, 3, 5, 6)
	Thursday, November 14: Gases, the Gas Laws, and the Ideal Gas Equation (Moog, CA 31; BLBMWS, Chapter 10, Sections 1-6)
Week 13: November 19-23	Tuesday, November 20: Kinetic Molecular Theory of Gases and Real Gases (Chapter 10, Sections 7, 9)
	Thursday, November 22: Thanksgiving
Week 14: November 26-30	Tuesday, November 27: Energy, Enthalpy, the First Law of Thermodynamics, and Enthalpy of Atom Combination (Moog, CA 32; BLBMWS, Chapter 5, Sections 1-3)
	Thursday, November 29: Exam 3 (Moog, CAs 23, 26-32; BLBMWS, Chapter 3; Chapter 4, Sections 2-6 (except The Activity Series); Chapter 10, Sections 1-7, 9)
Week 15: December 3-7	Tuesday, December 4: Enthalpies of Reactions, Calorimetry (Moog, CA 33; BLBMWS, Chapter 5, Sections 4, 5; Chapter 8, Section 8 (Bond Enthalpies and the Enthalpies of Reaction))
	Thursday, December 6: Hess's Law and Enthalpies of Formation (BLBMWS, Chapter 5, Sections 6-8)
Final Exam: Tuesday, December 11	FINAL EXAM, 1:00 – 3:00 pm, Cuneo Hall, Room 210

Information from other chapters may be introduced by the instructor as appropriate to specific topics.