CHEM 105: Chemical Principles
Fall 2022
Loyola University Chicago

The purpose of this syllabus is to describe the course, resources, and policies. It is meant help all students understand the expectations and requirements for the course, and it should be used as a reference for questions about policies. When updates to the syllabus are made during the term, a new version will be posted electronically, and all students will be notified.

Course Information

Course: Chemistry 105 – Chemical Principles (4 credits: Lecture, Lab & Discussion)
Prerequisites: Satisfactory performance on the Loyola math proficiency exam, or successful completion of MATH 117. A strong high school chemistry background is also highly recommended.

Course Description

This course is the first in a sequence of multiple chemistry courses designed to create foundational knowledge and proficiency in essential chemistry concepts and skills. It includes the following topics: atomic structure, periodic properties, characteristics of bonding and properties of molecules, solid states, interactions and connections of light and matter, quantum and molecular mechanics models of atoms and molecules. Historical and current developments in chemistry as well as real-world problems that chemists address are incorporated into the course.

Alongside specific content, themes will cycle through each of the foundational courses. The may include:

- Structure-activity relationships
- The culture and practice of science.
- Energy.
- Polymers, proteins, and macromolecules.
- Sustainability.
- Chemical synthesis, purification, characterization, and analysis.

Learning Outcomes

The emphasis of this course is on understanding, prediction, investigation, explanation and evaluation over memorization. This means that students must foster their problem solving skills, ability to make claims based on evidence, use and understanding of models and their limitations, and skills of effective communication of scientific results. It is not enough to know *what* happens in chemistry, the student must also be able to explain *why* it happens. When successful, a student will be able to:

- 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, periodicity, molecular structure, chemical bonding, gases, liquids and solids, solutions.
- Draw and interpret multiple representations of structures depicting connectivity, configuration, and conformations.
- Quantify relationships between variables controlling chemical systems.
- Differentiate among closely related factors, categorize problem types, and select appropriate tools to solve these problems.
- Apply chemical principles to explain natural phenomena.

Class Meeting Times and Locations

Type (Section)	Day & Times (CDT)	Location
Lecture (001)	**Tues. & Thurs., 1-2:15 pm**	**Flanner Hall Auditorium**
Discussion (002)	**Tues., 8:30-9:20 am**	**Flanner Hall 007**
Discussion (003)	**Tues., 10-10:50 am**	**Flanner Hall 007**
Discussion (004)	**Tues., 11:30-12:20 pm**	**Flanner Hall 007**
Discussion (009)	**Tues., 8:30-9:20 am**	**Mundelein 204**
Laboratory (005)	**Wed., 11:30-2:15 pm**	**Flanner Hall 305**
Laboratory (006)	**Wed., 2:45-5:30 pm**	**Flanner Hall 305**
Laboratory (007)	**Wed., 5:45-8:30 pm**	**Flanner Hall 305**
Laboratory (008)	**Thurs., 8:30-11:15 am**	**Flanner Hall 305**

Instructors and Support Team Information

Name	Role	Contact Information	Office hours
Patrick L Daubenmire, Ph. D.	Lecture/Discussion Instructor	pdauben@luc.edu, 773.508.8248 (off), 630.336.4180 (mobile)	Wed., 1-2:30 pm, Thurs., 12-1 pm, Others by appt.
Sandra Helquist, Ph. D.	Lecture/Discussion Instructor	shelquist@luc.edu Flanner Hall 200	Full schedule on Resources for Help (Sakai); by drop-in as needed
Andrew Basner, Ph. D.	Laboratory Instructor	abasner@luc.edu Flanner Hall 428 Office Hours Location: STEM Center is in St. Joseph's Hall.	Thur 1:00-2:00pm, Fri 1:00-2:00pm, Drop in as needed.
	Laboratory Teaching Assistant		
	Laboratory Teaching Assistant		
	Laboratory Teaching Assistant		
Brendan Crawford	Lecture/Discussion SI leader	bcrawford@luc.edu	
Rohan Sethi	Lecture/Discussion SI leader	rsethi1@luc.edu	

SI information

There are Supplemental Instruction (SI) study sessions available for this course. SI sessions are led by an SI leader, who is a student that has recently excelled in the course. Session attendance is open to all, and while it is voluntary, it is extremely beneficial for those who attend weekly. Times and locations for the SI session can be found here: www.luc.edu/tutoring. Students who attend these interactive sessions find themselves working with peers as they compare notes, demonstrate and discuss pertinent problems and concepts, and share study and test-taking strategies. Research shows students whom regularly attend sessions have higher grades at the end-of-the-semester and more deeply understand course concepts than those who do not. Students are asked to arrive with their Loyola ID number, lecture notes, and textbook.

Required Resources

(1) OpenStax Chemistry, Atoms First 2e. Web-only, digital, or printed version. https://openstax.org/details/books/chemistry-atoms-first-2e?Book%20details
(2) Moog, R.S. & Farrell, J.J. (2022). *Chemistry: A Guided Inquiry, 8th ed.* Kendall Hunt. ISBN 9781792490699 (print) or 9781792498855 (eBook).
(3) Online homework: ALEKS, see Sakai for additional information and recommendations
(4) Custom laboratory manual, *will be shared in class*.
(5) Bound edge composition notebook, safety goggles that meet ANSI Z87.1 standards (will be provided in lab), and laboratory coat (can purchase at the bookstore).
(6) Electronic resources, e.g., Loyola Sakai & email, Gradescope
(7) Scientific calculator

Connection to the "Hungers" of Loyola University's Transformative Education

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 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 understanding that chemistry is a human endeavor and it resides in the tension between helping and harming life.

Instructional Strategy – Process Oriented Guided Inquiry Learning (POGIL)

This course will not always follow a traditional lecture format for delivery of course content and skill development. Coupled with lecture presentations, this course will capitalize on students' current prevailing ideas and thoughts about sets of data or presented models. Then, through guided questions about the presented information, students, working in small groups, discuss ideas and come to consensus about answers to questions. These 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, and redirecting students when necessary. This format is designed based on the idea that knowledge cannot be directly transmitted from one person to another. Instead, knowledge must be built by the learner his or herself based on their own experiences and in dialog and discussion with others.

Four key ideas about learning have emerged from current research about how people learn. These include:

1. Constructing our own understanding based on our prior knowledge, experiences, skills, attitudes, and beliefs.
2. Following a learning cycle of exploration, concept formation, and application.
3. Discussing and interacting with others.

[1] http://www.luc.edu/transformativeed/

4. Reflecting on progress and assessing performance.

All of these ideas are incorporated into the design of POGIL in order to help students learn both discipline content and key process skills simultaneously, POGIL is built on this research base with the principles that most students learn best when they are:

1. Engaged and thinking in the classroom and laboratory.
2. Drawing conclusions by analyzing data, models, or examples and by discussing Ideas.
3. Working together in self-managed teams to understand concepts and to solve problems.
4. Reflecting on what they have learned and on improving their performance.
5. Interacting with an instructor as a facilitator of learning and peer as collaborating in building understanding of the chemistry content.

To support this research-based learning environment, POGIL uses learning teams, guided-inquiry activities to develop understanding, questions to promote critical and analytical thinking, problem solving, reporting, metacognition, and individual responsibility. These components are the tools for developing process skills and the mastery of discipline content and will use a blend of venues between face-to-face and online environments.

You will work together in learning teams through a series of ChemActivities (CA) modules. The modules are designed to help you acquire knowledge and develop understanding through guided inquiry - examining data, models, or examples followed by responding to critical thinking questions (CTQ). Generally, data are presented before a theoretical explanation, whereby the CTQ lead the student through the thought processes which results in the building of a certain theoretical model. This is what makes these modules guided-inquiry. Exercises & Problems are included to reinforce the concepts being presented.

For the ChemActivities (CA) modules, you will be placed into groups of 3 or 4 students with the following designations within each group: Manager, Recorder, Technician, & Presenter. These roles you may have throughout the semester when working in groups include:

- *Manager*: The student in this role ensures that the group is functioning efficiently and progressing within the time frame set by the instructor. This student is not a supervisor, but a full participant. Additionally, this student monitors the participation of all group members to make sure all ideas have been heard.

- *Recorder*: The student in this role transcribes the agreed upon responses of the group to questions and problems. The recorder is not solely responsible for doing the work, but is responsible for accurately recording the results of the group's work. There will be times during the semester when the group's answer(s) to certain questions will be collected. The recorder submits these responses.

- *Technician*: The student in this role primarily handles calculations and the management of equipment for the group. If special operating instructions are needed for an instrument during an activity, the technician is the point person for these applications and will be trained as necessary.

- *Presenter*: The student in this role represents the group during all class discussions or during inter-group interactions. Similarly to the recorder, the presenter's responses should accurately reflect the results of the work of the group.

Student Accommodations
Loyola University provides reasonable accommodations for students with disabilities. Any student requesting accommodations related to a disability or other condition is required to register with Student Accessibility Center (SAC), located in Sullivan Center, Suite 117. Professors receive the accommodation notification from SAC via Accommodate. Students are encouraged to meet with their professor individually in order to discuss their accommodations. All information will remain confidential. Please note that in this class, software may be used to record class lectures in order to provide equal access to students with disabilities. Students approved for this accommodation use recordings for their personal study only and recordings may not be shared with other people or used in any way against the faculty member, other lecturers, or students whose classroom comments are recorded as part of the class activity. Recordings are deleted at the end of the semester. For more information about registering with SAC or questions about accommodations, please contact SAC at 773-508-3700 or SAC@luc.edu. *If you use the Testing Center, please schedule all of the tests for this class at the beginning of the semester. If a scheduled test date changes, you will still be accommodated if you had scheduled your test in advance.*

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). The Department advises that it is preferable to complete a course with a grade of C or C-, and to demonstrate growth in future coursework, than to withdraw from a course.

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: https://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.

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: https://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. Evidence of cheating in this course will result in, at a minimum, a score of zero (which cannot be dropped from grade calculations) and penalty up to failure of the course. College policies include that instructors will report incidents of academic misconduct to their chairperson as well as to the Assistant Dean for Student Academic Affairs in the CAS Dean's Office. I will report incidents to the Chemistry & Biochemistry Department for further action(s).

Loyola University Absence Policy for Students in Co-Curricular Activities (including ROTC):
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 i.e., "Athletic Competition & Travel Letter" 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 to the professor in the first week of a semester. It is the responsibility of the student to make up any assignments. If the student misses an examination, the instructor is required to allow the student to take the examination at another time.
(https://www.luc.edu/athleteadvising/attendance.shtml)
Students who will miss class for an academic competition or conference must provide proper documentation to their instructor as early in the semester as possible.

Accommodations for Religious Reasons
If you have observances of religious holidays that will cause you to miss class or otherwise effect your performance in the class you must alert the instructor ***within 10 calendar days of the first class meeting of the semester*** to request special accommodations, which will be handled on a case by case basis.

Universal Absence Accommodation Policy
The purpose of a universal absence accommodation policy is to account for emergency circumstances (e.g., serious illness, caring for a family member, car accident) that require you to be absent from class, while maintaining fairness in grading for students who attend and complete all in-class graded assignments. We believe that class attendance and participation are essential for your success in this class, and that your health is important to us and our shared community. Please use good judgement and stay home if necessary/prudent for your circumstances.
This is the universal accommodation policy for in-class graded assignments:

- Group Assignments: the specification for an A is 90% to allow for missed work
- MCQ Exams: a missed in-class exam due to absence for any reason is accommodated in the course grading system under as Option 2 for weighting scores. Given that only the best two in-class exams are included in this calculation, a missed exam would be the one not included in this calculation, as it would be the lowest score (0%) of the three exams.
- MOs: you are eligible to submit for Proficiency after the first attempt at an MO whether you complete the problems or not; reattempts at Mastery are available during the term

You may provide documentation for an absence, but it is not required. These accommodations are automatically available to all students.

Other Items
• A link to the official Loyola calendar can be found here:
https://www.luc.edu/academics/schedules/
• The Withdraw deadline for the semester is on Friday, November 4.
• Loyola is using SmartEvals to provide instructor & course feedback. OIE will send emails near the end of the term.

Class Recording & Content Information
In general lecture, meetings may be recorded. The following is a mandatory statement for all courses in the College of Arts & Sciences (CAS). We will discuss class norms and standards during the first week and continue the discussion as needed throughout the semester.

Privacy Statement
Assuring privacy among faculty and students engaged in online and face-to-face instructional activities helps promote open and robust conversations and mitigates concerns that comments made within the context of the class will be shared beyond the classroom. As such, recordings of instructional activities occurring in online or face-to-face classes may be used solely for internal class purposes by the faculty member and students registered for the course, and only during the period in which the course is offered. Students will be informed of such recordings by a statement in the syllabus for the course in which they will be recorded. Instructors who wish to make subsequent use of recordings that include student activity may do so only with informed written consent of the students involved or if all student activity is removed from the recording. Recordings including student activity that have been initiated by the instructor may be retained by the instructor only for individual use.

Additional Content, Copyright & Intellectual Property Statement
By default, students may not share any course content outside the class without the informed written consent of the owner of that content. This includes any additional recordings posted by students, materials provided by the instructor, and publisher-provided materials. For example, lectures, quiz/exam questions, book figures/slides, and videos may not be shared online outside the class. In some cases, copyright/IP violations may overlap with breaches of academic integrity. Remember that obtaining consent to share materials is an active process.

Pass/Fail Conversion Deadlines and Audit Policy
A student may request to convert a course into or out of the “Pass/No-Pass” or “Audit” status only within the first two weeks of the semester. For the Fall 2022 semester, students are able to convert a class to “Pass/No-Pass” or “Audit” through Monday, September 12th. Students must submit a request for Pass/No-Pass or Audit to their Academic Advisor.

Health, Safety, and Well-Being On-Campus
Please be familiar with and adhere to all policies and protocols posted on the *Campus Info & Resources* site:
https://www.luc.edu/healthsafetyandwellbeing/campusinforesources/

Fall 2022 Classroom Masking Policy
We will follow all University guidance and requirements for masking, including any updates made during the semester. It will remain a principle of this class-section that, out of respect for the health of housemates and others in regular contact with members of our community, we will be respectful of anyone who wears a mask in the classroom.

Final Exam
The University sets the schedule for all final exams, and has posted the schedule for Fall 2022: link to schedule. The final will be held on Friday December 16th, 1:00-3:00 pm.
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 Adam Patricoski, Assistant Dean for Student Academic Affairs, CAS Dean's Office (apatricoski@luc.edu).

Course Evaluation
All of the following are required components of your course grade:

Laboratory Work
Laboratory experiences and work are integrated with the lecture portion of this course. A detailed description of those activities for the semester will be shared in your first meetings of your laboratory sessions.

ALEKS
Online, at www.aleks.com, with additional information and tips posted on Sakai. At the end of the semester, your Overall ALEKS grade is calculated from: 50% Modules + 5% Final Knowledge Check + 45% Pie Progress. Regular work (Learning topics in Modules) is due 2-3 times per week at 11:59pm as a combination of pre- and post-lecture work. Assessments or "Knowledge Checks" are also included to help you retain course content throughout the entire semester. Chemistry is a complex and challenging subject, so we have chosen ALEKS to make sure you master the basic, fundamental concepts in the course to fully advance your personal educational and career goals. We have solid data that show this service can improve mastery and retention, particularly for students who would otherwise have difficulty passing. What you must do is decide to trust the system when it assigns you work: trust that this is indeed the work you should be doing now, and that doing it diligently will build the essential mastery you need to succeed in chemistry as fast as possible. ALEKS will help you by finding out YOUR individual state of knowledge, and then tutoring you in only the topics on which YOU need to work. The list of topics to be mastered has been set for the course, and it is the same for everybody. But YOUR individual path is going to be unique to you. We will drop your lowest 2 Module scores from the overall grade calculation at the end of the semester to account for the instances when you may not be able to finish an assignment by the deadline.

Group Work
Participation, group responses and reports will be an important part of the class. This work will be a combination of individual effort and group work, completed in small groups (assigned by instructor). Students must be present during class sessions in order to receive credit for these assignments. Each group will submit a Report for each assigned activity, and Reports are graded based on completion. Many, but not all, of the Reports will come from POGIL activities.
Group Quiz content will include multiple-choice questions (MCQs) at the level of the exams and challenging free-response problems at the level of the Mastery Objectives in order to help you prepare for the grading standards upon which you will be tested individually. The purpose of

working challenging problems as a group is to help you learn via cooperation, communication, and support among your classmates as you push the limits of your knowledge. Each group submits one copy of their work for each assignment. Participating group members will receive quiz completion credit if the work they submit includes a meaningful attempt at completing all of the problems.

MCQ Exams

Three midterms and a final exam, completed individually. Allowed resources will be listed for each exam. Exams will consist of multiple-choice questions meant to test how well you understand and can apply the essential course concepts. Midterm exams focus on the recent material, including cumulative concepts, and the final exam will be comprehensive. Midterms are scheduled for the **September 22, October 20, and November 17**. Before each exam we will discuss all procedures & requirements. We will automatically calculate your grade using the higher weighted percentage between two options listed. If you miss a midterm for any reason, Option 2 will be used.

Option 1: Count all 3 midterms at 20% each + final exam, 40%
Option 2: Count the best 2 midterms at 25% each + final exam, 50%

Mastery Objectives

These are detailed Objectives (MO's) for the course that will be tested Individually in a Mastery format – you will see this format on your group quizzes. The purpose of the mastery-based system is to give you multiple opportunities to demonstrate your higher-level skills of applying and analyzing chemistry concepts. These MO's will challenge you to go beyond memorization of facts and processes and transfer your understanding of essential course concepts to new scenarios, which is why you will have options to revise work and reattempt MO's for Mastery credit. Some of the MO's are designated as Foundational for this course. The Foundational MO's form the base upon which you will build your knowledge in chemistry and related fields, in this course and beyond. Each round of testing on these objectives, typically 3 MO's per round, will be followed by opportunities for revision of work by the specified deadline. Revised work that is complete and correct by the deadline will receive Proficiency credit. It is expected that work that does not earn Mastery credit during testing will be revised as a pre-requisite for reattempting an MO in a later round of testing. If a successfully revised MO is reattempted and mastered during a later round of testing, the Mastery credit replaces the Proficiency credit previously earned: in other words, you cannot count both Proficiency and Mastery credit on the same MO toward your grade. Rounds of testing are scheduled for **September 22, October 20, November 17, and December 08**, with an additional round scheduled during the final exam period. Specific MO dates and timing will be announced at least one week in advance. All procedures, allowed resources and requirements will be posted before each round of testing.

Course Grading System Design

There are three basic principles that we have used to design the grading system for this course. These are for you to:

1. Understand what the standards and requirements are for each letter grade so that <u>you can choose</u> what level of academic achievement to pursue in this course. We encourage each of you to strive for high achievement because we believe in the potential of all students to learn and improve their abilities in chemistry.
2. Expect a <u>challenging but flexible</u> learning environment. The standards for demonstrating your Mastery of the course material are high in each area, but the methods for meeting the standards are designed to give you multiple chances to revise and improve the quality of your work throughout the semester.
3. <u>Learn from mistakes</u>. Deep, connected learning involves hard work and reflection on your progress. Chemistry is a cumulative subject where the new topics build on prior knowledge and this system is designed for cycles of learning.

Standards

The standards for each letter grade are listed here according to all required course components, listed in columns. You must meet or exceed all of the standards listed to earn the corresponding letter grade: standards are not averaged across components. These lists are intended for complete transparency: you do not need to do any extra work to figure out what is required for any grade, and we will revisit the standards and expectations after the early rounds of testing to help you gauge your progress in the course. Grades are only based on the criteria listed in the syllabus: no substitutions, and no additions. Descriptions of the components are found on the preceding pages.

A Standards
Laboratory Work: ≥ 90% total
ALEKS: ≥ 95% Overall Grade
100% Pie Progress
Final Knowledge Check
Group Work: ≥ 90% reports
≥ 9 quiz completions
MCQ Exams: ≥ 90% (weighted)
MO's: Mastery + Proficiency:
≥ 90% + 10%

B Standards
Laboratory Work: ≥ 80% total
ALEKS: ≥ 80% Overall Grade
≥ 85% Pie Progress
Final Knowledge Check
Group Work: ≥ 80% reports
≥ 8 quiz completions
MCQ Exams: ≥ 75% (weighted)
MO's: Mastery + Proficiency:
≥ 70% + 15%

C Standards
Laboratory Work: ≥ 70% total
ALEKS: ≥ 70% Overall Grade
≥ 75% Pie Progress
Group Work: ≥ 70% reports
≥ 7 quiz completions
MCQ Exams: ≥ 60% (weighted)
MO's: Mastery + Proficiency:
≥ 50% + 20%

A− Standards
Laboratory Work: ≥ 90% total
ALEKS: ≥ 90% Overall Grade
≥ 95% Pie Progress
Final Knowledge Check
Group Work: ≥ 90% reports
≥ 9 quiz completions
MCQ Exams: ≥ 85% (weighted)
MO's: Mastery + Proficiency:
≥ 85% + 10%

B− Standards
Laboratory Work: ≥ 80% total
ALEKS: ≥ 80% Overall Grade
≥ 85% Pie Progress
Final Knowledge Check
Group Work: ≥ 80% reports
≥ 8 quiz completions
MCQ Exams: ≥ 70% (weighted)
MO's: Mastery + Proficiency:
≥ 65% + 15%

C− Standards
Laboratory Work: ≥ 70% total
ALEKS: ≥ 70% Overall Grade
≥ 75% Pie Progress
Group Work: ≥ 70% reports
≥ 7 quiz completions
MCQ Exams: ≥ 55% (weighted)
MO's: Mastery + Proficiency:
≥ 40% + 25%

B+ Standards
Laboratory Work: ≥ 80% total
ALEKS: ≥ 80% Overall Grade
≥ 85% Pie Progress
Final Knowledge Check
Group Work: ≥ 80% reports
≥ 8 quiz completions
MCQ Exams: ≥ 80% (weighted)
MO's: Mastery + Proficiency:
≥ 80% + 10%

C+ Standards
Laboratory Work: ≥ 70% total
ALEKS: ≥ 70% Overall Grade
≥ 75% Pie Progress
Group Work: ≥ 70% reports
≥ 7 quiz completions
MCQ Exams: ≥ 65% (weighted)
MO's: Mastery + Proficiency:
≥ 55% + 20%

D Standards
Laboratory Work: ≥ 55% total
ALEKS: ≥ 55% Overall Grade
Group Work: ≥ 55% reports
≥ 5 quiz completions
MCQ Exams: ≥ 45% (weighted)
MO's: Mastery + Proficiency:
≥ 20% + 25%

Note: a student who fails to meet the standards for a grade of D will receive a grade of F for the course.

Posting of Grades

Final course grades at the end of the semester are posted only LOCUS. Grades are never sent via email. ALEKS scores are automatically recorded in the ALEKS Gradebook for that system. Scores for all other required components will be made available on Sakai. Each student will see an estimated midterm grade in LOCUS before the withdraw deadline.

Missed or late assignments may not be accepted. Instructors may ask for documentation or other verification.

Table 3. Proposed Semester Topics & Schedule

Session	Topic	Resources
Week 01	Atomic structure	
Essential understandings: · *Atoms have unique chemical identities based on the number of protons in the nucleus.* · *Atoms may have the same chemical identity but different masses due to differing numbers of neutrons, which form isotopes of elements.* · *Macroscopic samples of matter contain so many atoms that they are counted in moles.*		
Week 02	Atomic structure	
· *In chemical & physical processes, atoms maintain their identity.* · *Most information about atoms is inferred from studies on collections of atoms often involving an interaction with electromagnetic radiation.* · *Electrons play the key role for atoms with respect to chemical properties.* · *The quantum model of the atom is capable of explaining many observations and it organizes electrons into orbitals, which are wave functions that are identified using quantum numbers.* · *Ions arise when the number of electrons and protons are not equal in an atom.*		
Week 03	Atomic structure	
· *Atoms display a periodicity in their structures and observable phenomena that depend on that structure.* · *The periodic table reveals that some properties among the elements, such as atomic radius, ionization energy, and electron affinity, follow repeating patterns.* · *Effective nuclear charge, an atomic structure feature, is a useful model for explaining periodic trends in atomic properties.*		
Week 04	Chemical bonding	
· *The octet rule is a guideline to help us describe how and why main group elements gain, lose or share electrons.* · *Electronegativity trends and differences can be used to identify nonpolar covalent, polar covalent, and ionic bonds.*		
Week 05	Chemical bonding	
· *Metallic substances are modeled with a sea of valence electrons bonding positively charged ion cores.* · *Lattice energies and structures of ionic compounds are determined by the charges and sizes of the ions involved.*		
Week 06	Chemical bonding	
· *Lewis structures depict shared and unshared pairs of electrons (lone pairs, single, double, and triple bonds).* · *Lewis structures are predictive models.* · *Some molecules and polyatomic ions require multiple Lewis structures called resonance contributors to describe the bonding.*		

Week 07	Chemical Bonding	
· *Bonds are formed by overlap of orbitals between or among atoms.* · *Single, double and triple bonds can be described by sigma and pi bonding.*		
Week 08	Molecular Properties	
· *Lewis Structures can be used to predict bond lengths and strengths.* · *Energy is required to break covalent bonds, and energy is released when covalent bonds are formed.*		
Week 09	Molecular Properties	
· *Lewis Structures and VSEPR Theory can be used to predict geometry and polarity of molecules and ions.*		
Week 10	Molecular Properties	
· *Conformers arise from rotation around single bonds.* · *Conformational analysis allows us to understand and predict the spatial orientation of atoms.* · *Constitutional Isomers arise when bonded groups are connected in a different two-dimensional order.* · *Stereoisomers arise when bonded groups are arranged differently in three-dimensional space.*		
Week 11	Molecular Properties	
· *Constitutional isomers arise when bonded groups are connected in a different two-dimensional order.* · *Stereoisomers arise when bonded groups are arranged differently in three-dimensional space.*		
Week 12	Interparticle Properties	
· *All particles experience attractive forces.* · *Size, shape, and charge of particles determine the types and strengths of attractive forces in pure substances and mixtures.* · *Physical Properties can be predicted from types and strengths of interparticle attractions.*		
Week 13	Interparticle Properties	
· *Types of solids (molecular, ionic, metallic, covalent-network) and their properties can be understood based on interparticle attractions.* · *Ligand-metal bonding arises via Lewis acid-base behavior.*		
Week 14	Interparticle Properties	
· *Solutions are homogeneous mixtures of more than one chemical substance.* · *Water is a “universal solvent” and the properties of its solutions are determined by the types and amounts of dissolved particles.*		