CHEM 141: **PRINCIPLES OF MODERN CHEMISTRY I** Summer I 2025

UA Catalog name: **GENERAL CHEMISTRY LECTURE I: QUANTITATIVE**

Course description: CHEM 141 is the first part of a two-semester lecture series introducing students to the central principles of modern chemistry using a quantitative atoms-first approach. The course covers the foundations of chemistry and examines chemical properties of matter and bonding using the principles of Quantum Mechanics. No special mathematical background is needed, beyond the stated prerequisite requirements. The course aims to develop a deep understanding of general chemistry, rooted in a formal approach to the discipline, and is intended for students who wish to apply this knowledge to real problems they will encounter in their future careers. The class is presented in a combination of live and asynchronous formats, emphasizing practical problem solving, in-class enrichment, and review with the instructor. The flexibility inherent in these student-focused and student-centered approaches allows for individual choice of optimal study plans involving any combination of self-paced and live (in-person) learning for each student, depending on their individual circumstances, learning styles, and needs. The course is designed for all science and engineering majors, pre-medical and pre-pharmacy students, and is appropriate for any beginning student.

Credits	3 credit hours (lecture only)
Instructor	Dr. Tori Hidalgo | **tlockett@arizona.edu**
Teaching Assistant	None
Lecture	Completely online
Office Hours:	Times varied, via zoom – watch for announcements on D2L.

Prerequisites PPL 60+ or SAT I MSS 610+ or ACT MATH 26+ or one course from MATH 108, 112, 113, 119A, 120R, 122B, 125, 129, or 223. Test scores expire after 2 years. Must not have taken CHEM 105A/106A, CHEM 151, or CHEM 161/163. *These requirements are identical to those for CHEM 151.*

Relationship to Other Courses

CHEM 141 is the first-semester lecture component of the two-semester general chemistry lecture-lab sequence CHEM 141-144. The complete sequence consists of 4 separate courses:

CHEM 141: General Chemistry Lecture I: Quantitative (3 units)
CHEM 142: General Chemistry Lecture II: Quantitative (3 units)
CHEM 143: General Chemistry Quantitative Laboratory I (1 unit)
CHEM 144: General Chemistry Quantitative Laboratory II (1 unit)

The independent lecture-lab architecture allows for flexibility in plans of study.

Course Objective

The objective of CHEM 141 is to introduce the students to the fundamental principles and quantitative applications of modern chemistry.

Expected Learning Outcomes

After successfully completing CHEM 141, students will:

- have a basic understanding of the physical principles defining the structures and fundamental properties of atoms, molecules, and the states of matter;
- have a working knowledge of the periodic trends and be able to use the Periodic Table to describe the properties of atoms;
- understand the basic quantum-mechanical concepts involved in chemical bonding and the fundamental principles defining molecular geometries;
- be proficient in the quantitative description of chemical reactions and stoichiometry;
- be able to apply mathematical techniques and the laws of Physics to solve quantitative chemical problems, including the application of critical thinking,

- metric system, conversion of units, and scientific notation;
  ï be able to integrate the conceptual understanding and quantitative problem solving skills to describe, analyze, and model the structure and common properties of matter.

These outcomes apply to students of all majors and are also part of the integrated learning outcomes of the undergraduate programs in Chemistry and Biochemistry, described at http://assessment.arizona.edu/sci/chembio.

Text

Brown, LeMay, Bursten, *Chemistry: The Central Science*, 14th ed. (*required – available through your Inclusive Access to Mastering Chemistry*).
The textbook is a useful reference and study guide but is only a tool. Lectures will not be strictly based on the textbook and the presentation of the material in lecture will deviate from the book's outline.

Outline

Lecture topics and the corresponding textbook chapters (chapter numbers are based on the 14th edition):

- ï Matter and measurement: Classifications of matter; States of matter; Physical and chemical changes; Measurements of matter (Chapter 1).
- ï Atoms, molecules, and ions: Modern view of atomic structure; Empirical introduction to the Periodic Table of the Elements; Introduction to molecules, ions, molecular and ionic compounds (Chapter 2).
- ï The Mole; Chemical formulas and equations; Stoichiometry (Chapter 3).
- ï Reactions in solutions: Solution properties; Acids; Bases; Oxidation and reduction (Chapter 4).
- ï Introduction to Quantum Mechanics (Chapter 6).
- ï Electronic structure of atoms; Atomic orbitals; Electron configurations and the Periodic Table of the Elements (Chapters 6 and 7).
- ï Chemical bonding: Covalent and ionic bonds; Lewis and resonance structures (Chapter 8).
- ï Introduction to molecular orbitals; hybridization; prediction of molecular geometries (Chapter 9).
- ï Gases and gas mixtures: Ideal gas law; Introduction to kinetic molecular theory (Chapter 10).
- ï Intermolecular forces and introduction to real gases, liquids, solids, and phase transitions (Chapter 11).
- ï Elements of Thermochemistry (Chapter 5).

See the separate Schedule document on D2L for specific dates of various topics.

D2L

All course materials, such as the syllabus, schedule, lecture slides, etc., will be posted on D2L (http://d2l.arizona.edu). Please **do not** use D2L email to contact the instructor. Use the individual email address given above.

Inclusive Access

Course materials (including all homework assignments and your electronic text) are being delivered digitally via D2L through the Inclusive Access program.

Inclusive Access materials can be reached from the CHEM 141 D2L site through the VitalSource app on D2L is entitled: HOMEWORK and TEXTBOOK (VitalSource App). The link to this app is found under Content/eText & Homework.

VERY IMPORTANT: Please follow the instructions provided under the VitalSource app link on D2L under Content/eText & Homework. Hint for following the instructions: BrightSpace and D2L are for all intents and purposes the same thing.

Please access the material through D2L on the first day of classes to make sure there are no issues in the delivery, and if you are having a problem or question, it can be addressed quickly.

You automatically have FREE access to the course materials through June 13, 2025.

Notification to students mandated by the University: You **must** take action (even if you have not accessed the materials) to opt-out if you do not wish to pay for the materials, and choose to source the content independently. **The deadline to opt out is 9:00 pm MST, June 13, 2025.** If you do not opt-out and choose to retain your access, the cost of the digital course materials will appear on your Bursars account.

Instructor's note: If you opt out of Inclusive Access, you will not be able to complete any of the homework assignments and will receive zeros for all of them. This will severely impact your grade for the course. DO NOT OPT OUT WITHOUT TALKING TO THE INSTRUCTOR FIRST!!!

Please refer to the Inclusive Access FAQs at https://shop.arizona.edu/textbooks/Inclusive.asp for additional information.

IMPORTANT: Course instructor is not able to provide technical support for the online homework system hosted by the publisher (Pearson's Mastering Chemistry). In case of any technical/computer issues related to the homework assignments, please contact Support at Pearson.com: https://support.pearson.com/getsupport/s/

After submitting an assistance request, please make sure to capture your Pearson Tech Support Case Number ID for your reference.

Homework

This course uses the online homework system *Mastering Chemistry* hosted by the textbook publisher (Pearson). See Inclusive Access instructions below.

There will be 12 graded homework assignments (HW1-12). The main objective of the homework is to guide you in the study of the material and help prepare for the exams. The HW due dates are indicated in the Tentative Schedule available on D2L,

Homework	**Due Dates:**
HW 1:	10-Jun-25
HW 2:	12-Jun-25
HW 3:	13-Jun-25
HW 4:	17-Jun-25
HW 5:	19-Jun-25
HW 6:	23-Jun-25
HW 7:	25-Jun-25
HW 8:	27-Jun-25
HW 9:	02-Jul-25
HW 10:	04-Jul-25
HW 11:	07-Jul-25
HW 12:	08-Jul-25

Exams

There will be three midterm exams, each 1 hour in duration, and a final exam, 2 hours in duration. The exams will be administered via the Quizzes section of the D2L site. Exams can be taken at any time within the 24-hour period on the day of the exam (midnight to midnight). However, **once you start the exam, you will have one hour (for midterms) or two hours (for the final) to complete it**.

The exam schedule for 2025 Summer Session I is:

Midterm Exam 1: Wednesday, June 18
Midterm Exam 2: Thursday, June 26
Midterm Exam 3: Thursday, July 3
Final Exam: Wednesday, July 9

Topics and format of the exams: The first midterm exam will cover the material of HW 1-4. The second exam will be based on HW 5-7, the third – HW 8-9. The final exam will emphasize the material covered on HW10-12 but will also include a cumulative part covering the material of the entire course. All exams will be open book but must be solved by each student individually. Any discussion or interaction with others (either in person or by electronic means) while taking an exam will be viewed as an academic integrity violation.

Missed and Make-up Exams You can take each exam anytime during the 24-hour window when the exam is open. **THERE WILL BE NO MAKE-UP EXAMS** outside of the stated exam windows. Missed exams will be graded as zeros.

Calculators Scientific (non-graphing, non-programmable) calculators with standard exponential, trigonometric, power/root, log, etc. functions are recommended for this class.

Grading Course letter grades will be based on the following percent breakdown:

Lecture PlayPosit questions	5 %
Homework assignments	20 %
1-12: Three midterm exams:	50 %
Final exam:	25 %
TOTAL:	100 %

The above are the only sources of points that can be earned in the class. No extra credit will be awarded for any additional work. No requests for extra-credit assignments to improve grades will be considered, because granting such requests would be in violation of this syllabus and unfair to other students.

The letter grades will be nominally based on the University of Arizona standard A/B/C/D/E = 90/80/70/60 per cent scheme. The exam/HW/assignment scores will not be "curved". However, **the instructor may revise the letter grade cutoffs** (in the easing direction only) based on the final point distribution. This means that earning 90% of the total points will guarantee you an 'A', while earning slightly less may result in either a lower grade or an 'A', depending on where the actual cutoffs

learning strategies, and the grading4policy.

are drawn. Similar for other grades. The cutoff adjustment is at the instructor's discretion; it is neither promised nor guaranteed. Different cutoffs may be adjusted by different amounts, while some cutoffs may be left unchanged (for example, the D/E and C/D cutoffs may be lowered, while A/B and B/C held firm – or vice versa.)

SPECIAL NOTE ABOUT REQUESTS TO "DISCUSS" GRADES: The grades will be based solely on your quantitative performance in the class and are not up for subjective negotiation. No other factors in addition to those described above may be considered (including, but not limited to, the need to get a certain grade to maintain a scholarship or get into a certain professional school). Since the grades are determined by objective mathematical factors only, the instructor will not respond to requests for higher grades or to requests for meetings to discuss or negotiate grades, except if a grading error has been made. The instructor is available to review the subject matter, learning strategies, and the grading policy.

SPECIAL NOTE ABOUT POSTED LETTER GRADES: It is always disappointing to find yourself just below the cutoff for the grade you really wanted or needed. The University requires that specific grades be assigned in accordance with the grading policy and the grade cutoffs have to be drawn somewhere. Unfortunately, no matter where they are drawn, no matter how much thought goes into determining the reasonable levels, *someone* will always be at the top of any grade range – and there is nothing that can be done about it. Bumping someone from the top of a lower grade range to the next grade level will result in someone else turning up at the top of the lower range. Please do believe that faculty have every desire to satisfy reasonable request from their students – after all, we work for your success – but requests for higher grades without any basis in the syllabus only create undue stress for everyone. This class will adhere strictly to the following policy:

ONCE POSTED, THE LETTER GRADES ARE FINAL AND NOT SUBJECT TO DISCUSSION OR NEGOTIATION

With the exception of extremely rare cases of grade miscalculation, the instructor reserves the right not to respond to communications about the posted letter grades.

University policy regarding grades and grading systems is available at: http://catalog.arizona.edu/policy/grades-and-grading-system

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete and http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal respectively. A grade of "Incomplete" can only be obtained when all but a minor portion of the course work has been satisfactorily completed and a valid argument can be made as to why an Incomplete should be awarded. For example, missing the final exam due to a documented emergency (assuming satisfactory performance for the duration of the semester) will likely result in an Incomplete. To the contrary, realizing at any point during the semester that you are in danger of a failing grade is not a valid reason for granting an Incomplete.

Syllabus Content

Students are responsible for knowing the content of this document. Questions about the Syllabus content may appear on some of the in-class participation quizzes and/or exams. The instructor reserves the right not to respond to emails with questions explicitly addressed in the Syllabus. For example, any and all emails inquiring about the "curve" for the class will not be answered, because this question is explicitly addressed in the above grading policy. Similarly, the instructor will not respond to requests for additional points or opportunities to raise your grade, or other similar requests to discuss or negotiate grades (except if a grading error has been made), as such requests violate the grading policy stated in this Syllabus.

Absence and Class Participation Policy

Students are responsible for all information and materials presented in the lecture, whether or not they were present. Participating in the course and attending lectures are vital to the learning process. As such, attendance is required for all lectures.

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is at http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop.

The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, http://policy.arizona.edu/human-resources/religious-accommodation-policy. In accordance with the University policy, the instructor will provide

reasonable accommodations for students observing religious holidays, if the dates of observed holidays overlap with the exams in the class.

The calendar of the religious holidays recognized by the University of Arizona is posted at https://www.registrar.arizona.edu/religiousholidays/calendar.htm. In order to receive accommodation, the students are required to inform the instructor in writing (by email) about the potential conflict between the observed holiday(s) and the scheduled exam dates. **Accommodation requests** for all holidays that occur during the semester **must be received by the instructor during the first week of classes**. The instructor is not obligated to provide accommodation for exams missed due to holidays, if the request is not submitted during the first week of the semester.

Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: https://deanofstudents.arizona.edu/absences

Participating in the course and attending lectures and other course events are vital to the learning process. As such, attendance is required at all lectures. If you anticipate being absent, are unexpectedly absent, or are unable to participate in class activities, please contact the instructor as soon as possible. *To request a disability-related accommodation to this attendance policy, please contact the Disability Resource Center at (520) 621-3268 or drc-info@email.arizona.edu.* If you are experiencing unexpected barriers to your success in your courses, the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office is located in the Robert L. Nugent Building, room 100, or call 520-621-7057.

Threatening Behavior Policy

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Accessibility and Accommodations

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, you are welcome to let me know so that we can discuss options. You are also encouraged to contact Disability Resources (520-621-3268) to explore reasonable accommodation. All testing accommodations must be arranged through DRC.

If you have reasonable accommodations, please plan to meet with me by appointment or during office hours to discuss accommodations and how my course requirements and activities may impact your ability to fully participate.

Please be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable.

Code of Academic Integrity

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: http://deanofstudents.arizona.edu/policies-and-codes/code-academic-integrity

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are

subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

UA Nondiscrimination and Anti-Harassment Policy

The University is committed to creating and maintaining an environment free of discrimination; see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy

Additional Resources for Students

UA Academic policies and procedures are available at http://catalog.arizona.edu/policies
Student Assistance and Advocacy information is available at
http://deanofstudents.arizona.edu/student-assistance/students/student-assistance

Confidentiality of Student Records

http://www.registrar.arizona.edu/personal-information/family-educational-rights-and-privacy-act-1974-ferpa?topic=ferpa

Subject to Change Statement

Information contained in the course syllabus may be subject to change, with advance notice, as deemed appropriate by the instructor.