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

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

Credits: 3 credit hours (lecture only)

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 is intended for students who require a strong foundation in general chemistry, rooted in a technical (mathematical) approach to the discipline. It specifically targets science and engineering majors and other students interested in a systematic development of modern chemistry.

Instructor Professor Steven Schwartz sschwartz@arizona.edu

Class time Sections 101, 201, 401: Online (asynchronous)

Office Hours There will be TA's support for the class. Each TA will hold one hour of office hours per week. That schedule will be posted on D2L. To discuss individual academic matters, one-on-one meetings with the instructor can be scheduled by request.

Note: The CHEM 141 instructional team is not able to assist with CHEM 145 (labs). These are separate courses – please contact your lab instructor or TA.

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

Prerequisites Appropriate math placement level OR Proctored/Prep for College Algebra 88+

OR Proctored/Prep for Calculus 65+ OR MATH 109C, 110, 112, 113, 120, 120R, 124, 125, 129, 223. *These requirements are identical to those for CHEM 151.*

Textbook Brown, LeMay, Bursten, *Chemistry: The Central Science*, 15th ed. (*required*). The textbook is a useful reference and study guide, but it is only one of the study tools. Lectures will not be strictly based on the textbook and the presentation of the material in lecture will deviate from the book's outline.

D2L All course materials, such as the syllabus, schedule, lecture slides, etc., will be posted on D2L (http://d2l.arizona.edu).

Pre-Recorded Lectures Lectures covering all material have been pre-recorded and are available on the website choosing. The Course Schedule PDF document posted on D2L under Content/Start Here specifies the lectures that must be watched and studied on each class day. NOTE: The schedule is for guidelines only. If you wish to move more quickly, please do.

At the end of each video, you will be asked to check a box and press a button, purportedly to submit your "grade" for watching the video to D2L. Do check that box, but please know that no credit is awarded just for watching the videos. Graded points in this class are based only on HW assignments and exams (see the Grading Policy section of this Syllabus). The checkboxes in the videos are to help you and the instructor track your progress, not for actual grading.

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;
- 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.

Relationship to Other Courses

CHEM 141 is the first-semester lecture component of the two-semester general chemistry lecture-lab sequence CHEM 141-146. 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 145:	General Chemistry Quantitative Laboratory I (1 unit)
CHEM 146:	General Chemistry Quantitative Laboratory II (1 unit)

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

Outline

Class topics and the corresponding textbook chapters (chapter numbers are based on the 15th edition):

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

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

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: Inclusive Access: Homework and eTextbook (VitalSource). The link to this app is found under (HW and eText).

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 with the delivery. Do not sign up for any trials and do not enter any credit card numbers—if you are enrolled in the class, you should automatically have access to the materials through the VitalSource App mentioned above. If you are being asked for a credit card, you are in a wrong place!

Notification 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 11:59 pm MST, Sep 8, 2024.** 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: Inclusive Access to the textbook and homework (HW) assignments is **required** for this class. If you opt out of Inclusive Access, you will not be able to complete any of the HW assignments and will receive zeros for all of them (even the ones completed before opting out!). This will severely impact your learning and grade for the course. **DO NOT OPT OUT IF YOU WISH TO TAKE THIS COURSE!!!**

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 homework assignments (HW1-12). Their main objective is to guide you in the study of chemistry and help prepare for the exams. The HW due dates are given in the Course Schedule PDF document posted on D2L under Content/Start Here. All assignments must be finished by 11:55 PM (AZ time) on the due dates.

Exams

There will be three midterm exams, each 50 min in duration, and a final exam, 2 hours in duration. The exams are unproctored, open-book, and administered via the Quizzes section of the D2L site. All exams can be taken (started) at any time

from 5 AM to 7 PM (**AZ time**) on the day of the exam. **Once you start the exam, you will have 60 min (for midterms) or two hours (for the final) to complete it**.

The dates of the exams and the topics covered are in the Course Schedule PDF document posted on D2L under Content/Start Here.

Midterm Exam 1:	Friday, Sep 26
Midterm Exam 2:	Friday, Oct 24
Midterm Exam 3:	Wednesday, Nov 19
Final Exam:	Friday, Dec 12

Please note the dates of the exams. **There will be no makeups**.

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.

Although the exams are open book, they must be solved by each student individually, without the use of outside assistance or external resources (with the exception of the textbook, class notes and other materials provided by the instructor). 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.

The exams can be taken remotely from any location. The exams must be taken on a computer (not a phone) through the course D2L site. No paper versions of the exams will be available.

NOTE ABOUT EXAM KEYS AND EXAM REVIEWS: The midterm and final exams are assessment instruments, rather than study tools. All exams in this class are confidential and copy-protected, similar to standardized national exams. For this reason, no exam keys will be posted, and you will not be able to review the exams you have already taken. Students are advised to review the homework assignments (which *are* intended as study tools) in preparation for each exam.

Missed and Make-up Exams

You can take (start) each exam anytime during the window when the exam is open. The exams can be taken from anywhere on planet Earth, all you need is a computer with internet access. For this reason, except for extraordinary, documented emergencies, **THERE WILL BE NO MAKE-UP EXAMS**. Missed exams will be graded as zeros.

Calculators

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

Grading

Course letter grades will be based solely on the total number of points earned. The weights of the graded assignments in the grade calculation will be as follows:

Homework assignments 1-12:	30% combined
Three midterm exams:	45% combined
Final exam:	25%

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 based on the total percentage of points earned during the semester ("Total") and assigned according to the following grading scheme:

A:	$90.00 \leq \text{Total}$
B:	$80.00 \leq \text{Total} \leq 89.99$
C:	$68.00 \leq \text{Total} \leq 79.99$
D:	$55.00 \leq \text{Total} \leq 67.99$
E:	$\text{Total} \leq 54.99$

"THE CURVE": If the class average for any exam (including only the students who have attempted the exam) is below 73%, all individual non-zero scores for this exam will be automatically increased by the amount of the deficit, bringing the average to 73%. This adjustment may result in some students earning more than 100% for that exam. For example, if the class average for Exam X is 70%, 3 percentage points will be added to all exam scores. If two students received 65% and 98% for the exam (prior to the adjustment), their recorded scores will be 68% and 101%, respectively.

No adjustments will be made if the class average for an exam is 73% or higher. No adjustments will be made for homework assignments.

The above adjustments are intended to ensure a fair and balanced final grade distribution, regardless of the difficulty of the exams. Given the historic average of about 83% for all homework assignments, the minimum exam average of 73% ensures a total class average of at least 76% for the semester.

Except for the adjustments described above, no extra points or percentages will be added to any of the exam or assignment scores or to the total number of points earned in the class.

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.

NOTE ABOUT POSTED LETTER GRADES: It is always disappointing to find yourself just below the cutoff for the grade you really wanted. The University requires that specific grades be assigned in accordance with the grading policy, and the grade cutoffs must be drawn somewhere. Unfortunately, no matter how much thought goes into determining where they are drawn, *someone* will always be at the top of every grade range—and there is nothing that can be done about it. Bumping someone from the top of a lower 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 accommodate 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 policy:

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

Except for extremely rare cases of grade miscalculation, the instructor reserves the right not to respond to communications about posted 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.

Behavior Policy

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

While you will be taking this class online, we do encourage interactions between students as part of the learning process. We expect these interactions to strictly adhere to University of Arizona behavior guidelines. No threats or demeaning of any other students through any communication means will be tolerated.

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.

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, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.