School of Molecular Sciences
ARIZONA STATE UNIVERSITY

CHM 117: General Chemistry for Majors I

Fall 2019; MWF, 10:45-11:35, LSA 191

Credit: 3 units

Recitation Times are determined by Section Number and occur in PSH-135:

Section	Time
78472	Monday, 4:30-5:20
80727	Tuesday, 5:30-6:20
73441	Thursday, 9:30-10:20

Instructor Information

All Faculty can be reached by e-mailing chm117@asu.edu ! Direct all inquiries not of a personal nature to this address for fastest response.

Prof. Anne Katherine Jones (Associate Professor, School of Molecular Sciences)
jonesak@asu.edu
Office Location: Physical Sciences D-105
Office Hours: Wednesdays 11:45-12:45; Thursdays 2:00-3:00, or by appointment.

Mr. Tim Lamb (Recitations and CHM 111)
TDLamb@asu.edu
Office: Physical Sciences H Room 432
Office Hours: M/W 9:30-10:30 and T/Th 1:30-2:30

Teaching Assistant and Tutoring Information

Kanchana Chandrakanthan (117 Recitation); Benjamin Boyd, Ryu Hsu, John Jamboretz, and Rose Snyder

CHM 117 TAs are available in the Chemistry Learning Resources Center (Physical Sciences H-wing Room 137) at the following times: TBD.

Additionally, this center is continuously staffed with chemistry TAs Mon-Thurs 8:00 am-9:00 pm and Fri 8:00 am-4:30 pm. Any of them should be able to answer your questions and provide free tutoring.

Course Description and Objectives

Course Description: Lecture course in general chemistry for chemistry and biochemistry majors and is complemented by the CHM 111 laboratory course. Covers electronic structure of atoms and molecules, intermolecular forces, bonding models, molecular geometry, physical states of matter, gas laws, and chemistry of condensed matter and modern materials. Highlights chemical reactivity, periodic trends and descriptive chemistry. Both CHM 111 and CHM 117 must be taken to secure SQ General Studies credit.

Prerequisites: Biochemistry, Biophysics, or Chemistry major; CHM 101 with C or better, or Mathematics Placement Test score of >=50%, or ALEKS score of >=61, or Pre- or corequisite(s): MAT 170, 171, 210, 251, 265, or 270 with C or better if completed.

Learning Objectives:

- Describe and analyze chemical structure, physical structure, and reactivity of matter
- Define electronic structure of atoms, molecules, and materials and correlate with chemical properties
- Write and interpret chemical equations
- Describe gases, liquids, solutions and solids in terms of composition, properties, and forces

Course Learning Materials

Course Website: Detailed course information, notes, announcements, etc. can all be found on the course website in Canvas.

Textbook:

There is no required textbook for this course. Packets of notes devised for this course will be provided as pdf files on the course website according to the course timetable. It is your responsibility to print them and bring them to class if you desire. Alternatively, they can also be annotated on a tablet.

If you like having a textbook as a reference, you may consider a couple of different options. **Bear in mind that the course will not follow either of these books closely.**

1. "Chemistry-Structure and Properties, 2nd edition, by Nivaldo Tro". If you are interested in the electronic version of this book, please see the course website before purchasing it somewhere else. However, be aware that we will not follow this book closely (although we consider it a good reference).
2. "Chemistry: Atoms First from Open Stax" (https://openstax.org/details/books/chemistry-atoms-first) is a free textbook that provides reference information for most of the topics we will be covering It provides a different perspective for those seeking more information at low cost.

Homework/ Mastering Chemistry Access

You will need access to "Mastering Chemistry" for homework and quizzes. You can buy a standalone access code kit, or purchase access from the publisher's registration website (**easiest method**).

Follow this link for detailed instructions: https://canvas.asu.edu/courses/26312/pages/mastering-chemistry-hw-site

You will need pay pal or a credit card and your ASU ID# (e.g. 1214601873, not your posting ID).

You are expected to complete the registration the first days of classes. **Use an e-mail address you check regularly, as professors will use the same platform to send announcements when needed.**

The price for Mastering Chemistry access is $69.99 (as of August 2019). You **do not** need to purchase the book. However, if you would like to have a book for reference, you can purchase access to the e-text of Chemistry-Structure and Properties, 2nd edition, by Nivaldo Tro" together with your Mastering Chemistry access (ISBN-13: 978-0-13-456509-5 , $119.99 as of August 2019). If you prefer to purchase the actual book, use ISBN-13: 978-0-13-443652-4 for the digital + print version (including MC access), or ISBN-13: 978-0-13-429393-6 for the print book alone. **Note: We are not closely following this book, and you are not required to buy it!** Mastering Chemistry Access will also apply to CHM 118 in spring, i.e. you will not need to buy it again.

Although the homework is electronic**, it is useful to keep a homework notebook**. Then you have notes to study for the exams and also a record of what you have done. Then, if you want to ask questions in office hours, you are prepared, and the course staff can see your work to evaluate what you may have misunderstood. **The goal of the homework is not correct answers but learning**. Recording the process helps you remember what you have learned.

Assessments and Final Course Grades

The final course grade will be calculated using the following categories:

Assessment	**Points**
Recitation Activities	100
Homework Assignments	250
Quizzes	65 extra credit
Midterm Exam 1	100
Midterm Exam 2	100
Midterm Exam 3	100
Midterm Exam 4	100
Final Exam	250
Total	*1000 + 65 Extra Credit*

Students will be assigned the following final letter grades, based on points acquired from the course assessment section. **There is no curve.**

A+	A	A-	B+	B	B-	C+	C	D	E
>950	900-949	850-899	800-849	750-799	700-749	650-699	550-649	500-549	< 500

Decimal totals of points will be **rounded down** before assigning letters grades.

The grade XE will be recommended in cases of Academic Integrity Policy violations.
The grade I (Incomplete) will only be given in serious and documented cases to students who were performing passing work before the unforeseeable circumstances.

An online spreadsheet can be used to **track your progress** and determine scores necessary to achieve your desired grade. The spreadsheet can be found here:
https://docs.google.com/spreadsheets/d/1bKZFlJhn2_YTjqWv_FgzmiwRe3t6xf0vFUzuWfh4FAo/edit?usp=sharing

Exam Dates:

Midterm 1, Friday, 20 September
Midterm 2, Friday, 11 October
Midterm 3, Friday, 8 November
Midterm 4, Friday, 6 December
Final Exam: 9:50-11:40 am on Wednesday, 11 December 2019

These dates are fixed and will not be moved. Please note them now to ensure you can attend.

- **Recitation Activities**: Recitation will meet weekly in PSH-135. You will work in groups to complete recitation activities each week. The purpose of these activities will be to reinforce concepts learned in lecture and deepen your understanding of the material. Please note that attendance is **mandatory** and will be taken via ID scans. Missing four or more recitation activities will result in a full letter grade reduction in your course grade. There will be eleven recitation activities each worth 10 points. The lowest score in the semester will be dropped. You will receive more instructions about the recitation policies in your first session.
- **Homework Assignments**: There are two preliminary homework assignments to acclimate you to Mastering Chemistry each worth 5 points. Additionally, there are twelve homework assignments in the Mastering Chemistry Website each worth 20 points for a total of 250 points. Deadlines and grading policies are explained in each assignment in the Mastering Chemistry system. You will lose 5% credit per day for any assignment submitted late, up to 50%. This means you can complete an assignment months late and still earn 50% of the original points. There are no make-up opportunities for missed homework assignments.
- **Quizzes**: Thirteen online quizzes will be assigned in parallel to the homework assignments using the Mastering Chemistry Website. Quizzes will be timed, and all are optional (5 extra credit points each for a total of 65 points). Quiz scores will be not dropped for any reason, and there will be no make-up opportunities. These are entirely optional and extra credit. Take advantage of this opportunity. Additional extra credit opportunities will not be offered at the end of the semester since one is available each week. Quizzes may be re-opened after the deadline for chemistry practice, but you will not receive any credit after the deadline. Be aware that you can rework only assignments that are completed and you won't have access to quizzes you didn't submit before the deadline.
- **Midterm Exams:** Midterm exams will consist of a mixture of multiple choice and short answer questions that test both conceptual and problem-solving abilities. Exams will require a calculator, and you will not be allowed to use a cell phone, tablet, computer, or any other device that allows communication with other devices.
- **Make-up Midterm Exams**: Students will have the opportunity to make-up **one** midterm exam the day of the final exam. The grade of the make-up midterm will replace the original grade regardless of whether it is higher or lower.
- **Missed Midterm Exams:** Notify the course instructors **in advance** if you will need to miss an exam for **religious practices** or due to a **university-sanctioned activity**. **For unforeseen circumstances**, a student will not be penalized for a missed examination provided that the student provides the professor with an acceptable written excuse no later than 2 days after the date on which the test was given. Examples of acceptable excuses for a missed examination are: incapacitating illness or accident, serious illness or death in the immediate family, etc. A signed note from a doctor or equivalent documentation will be required and **always checked**. Resolution of all other situations will be left to the discretion of the instructor.
- **Final Exam:** The final exam will be comprehensive, i.e. it will cover all material presented in the course throughout the entire semester.

Honors Contracts

Prof. Thomas Moore will be leading supplementary discussion sessions for students interested in completing Honors Contracts as part of this course. These sessions will explore applications of concepts from this course in current contexts. Sessions will take place in LSE 250 on Tuesdays at 4:00-5:00 pm or in PSH-132 on Wednesdays at 5:00-5:50 pm. **To receive Honors credit, students will need to register for an honors contract.** Then, students can attend either of the two sessions offered each week, but must attend a minimum of 8 sessions out of 11 offered. There will be reading and writing assignments associated with each session. If you have questions, e-mail CHM117@asu.edu or discuss with the course instructors. Registration is through the portal associated with the Honors College.

Classroom Policies, Etiquette, and Recommendations

Attendance is not required, but the faculty assume you are attending regularly. If you miss a class, it is your responsibility to check material covered in class that day including any announcements made.

Address Professors and TAs professionally and respectfully. That includes writing e-mails as if you were in a workplace. See the course website for recommendations to compose polite e-mails.

Read the syllabus, course website, and course announcements regularly. **Announcements will be posted through the course Canvas site.** Don't ask questions that are clearly answered in those resources.

Regrading exams: Mistakes happen in grading. If you honestly believe an error has been made in grading an assignment, complete the "Re-grade petition form" found in the "exams" section of the website. You have one week from the time the exam is returned to bring concerns to our attention. Requests will not be considered after that time.

Don't be in the classroom if you prefer to be somewhere else. That means during class not talking or using your cell phone, even for texting, web browsing, or checking e-mails.

Preliminary Schedule of Topics

Note: This schedule is preliminary and subject to change. It will be updated throughout the semester to reflect course progress.

The column labelled reading indicates sections covering related material in the optional, reference texts. **These are not required readings**. OS indicates the relevant section in the OpenStax book, and Tro indicates the relevant sections in the Tro textbook.

	Date	Topic	Reading	Assignments
1	Fri, 23 Aug	Welcome		
2	Mon, 26 Aug	The Atomic Scale: Structures, Sizes, Amounts, Moles	**OS**: Chapter 2; 10.5; **Tro**: Essentials, 1.10	
3	Wed, 28 Aug	Atoms, Elements, and the Periodic Table	**OS**: Chapter 2; **Tro**: 1.8-1.9	
4	Fri, 30 Aug	Quantum Mechanics I: Wave-Particle Duality	**OS**: Chapter 3; **Tro**: 2.2-2.3	Introduction to MC, HW 0; Quiz 0

5	Mon, 2 Sept	Labor Day, No Class		
6	Wed, 4 Sept	Quantum Mechanics II: Uncertainty, Orbitals and Schrödinger's Equation	**OS**: Chapter 3; Tro: 2.4-2.5	
7	Fri, 6 Sept	Quantum Mechanics III: Shapes and Energies of Orbitals and Multielectron Atoms	**OS**: Chapter 3; **Tro**: 2.6	HW 1; Quiz 1
	Mon, 9 Sept	Quantum Mechanics IV: Ground State Electron Configurations, Core and Valence Electrons	**OS**: Chapter 3; **Tro**: 3.3-3.4	
8	Wed, 11 Sept	The Periodic Table and Properties	**OS**: Chapter 3; **Tro**: 3.5-3.9	
9	Fri, 13 Sept	The Periodic Table and Properties	**OS**: Chapter 3; **Tro**: 3.5-3.9	HW 2; Quiz 2
10	Mon, 16 Sept	Review		
11	Wed, 18 Sept	Review		HW 3; Quiz 3
12	Fri, 20 Sept	Exam 1		
13	Mon, 23 Sept	Why do atoms form bonds? MOs	**OS:** 4.2/5.4; **Tro**: 5.2, 6.4	
14	Wed, 25 Sept	Molecular Orbitals for Molecules with more than two electrons	**OS**: 5.4; **Tro**: 6.5	
15	Fri, 27 Sept	Lewis Structures: Model for Bonding in Multi-atom Molecules	**OS**: 4.4-4.5; **Tro**: 4.4, 4.7, 5.3-5.5	HW 4; Quiz 4
16	Mon, 30 Sept	Molecular Shapes Matter	**OS**: 4.6; **Tro**: 5.7-5.10	
17	Wed, 2 Oct	Extended Structures: Bonding in Metals vs. Non-metals	Not covered in OS or Tro	
18	Fri, 4 Oct	Bonding and Electrical Properties: Conductors, Semiconductors and Insulators	**OS**: 5.4 Band Theory; **Tro**: 12.8	HW 5; Quiz 5
19	Mon, 7 Oct	Ionic Structures	**OS**: 4.1 (not really helpful); **Tro**: 4.5; 12.4-12.7	
20	Wed, 9 Oct	Intermolecular Forces	**OS**: 10.1; **Tro**: 11.3	HW 6; Quiz 6
21	Fri, 11 Oct	Exam 2		
	Mon, 14 Oct	Fall Break		
22	Wed, 16 Oct	Writing and Balancing Chemical Equations I		
23	Fri, 18 Oct	Writing and Balancing Chemical Equations II		NO HW and Q this week
24	Mon, 21 Oct	Reaction Stoichiometry I		
25	Wed, 23 Oct	Reaction Stoichiometry II		
26	Fri, 25 Oct	Solutions and concentration		HW 7; Quiz 7

27	Mon, 28 Oct	Preparing solutions and dilutions I		
28	Wed, 30 Oct	Preparing solutions and dilutions II		
29	Fri, 1 Nov	Acid-base reactions I		HW 8; Quiz 8
30	Mon, 4 Nov	Acid-base reactions II		
31	Wed, 6 Nov	Buffer/review		HW 9; Quiz 9
32	Fri, 8 Nov	Exam 3		
	Mon, 11 Nov	Veteran's Day		
33	Wed, 13 Nov	Redox reactions I		
34	Fri, 15 Nov	Redox reactions II		HW 10; Quiz 10
35	Mon, 18 Nov	Kinetic molecular theory of gases		
36	Wed, 20 Nov	Ideal gases I		
37	Fri, 22 Nov	Ideal gases II		HW 11; Quiz 11
38	Mon, 25 Nov	Intermolecular forces in molecules I		
39	Wed, 27 Nov	Intermolecular forces in molecules II		
	Fri, 29 Nov	Thanksgiving		
40	Mon, 2 Dec	Real gases I		
41	Wed, 4 Dec	Real Gases II (concepts for final)		HW 12; Quiz 12
42	Fri, 6 Dec	Exam 4		Last Day of Class
	Wed, 11 Dec*	**Final Exam**		

*Final Exam Time: 9:50-11:40

Tips for Studying and being Successful

The course focuses on conceptual understanding and problem solving (not memorization). You will develop critical thinking skills, proficiency in solving mathematical and chemical problems, and the ability to evaluate whether your answer to a scientific problem makes sense. To be successful, you must understand material and be able to apply it to new situations.

Here are a few tips to be successful in this and other (chemistry) courses:

- **Use a calendar**. Consistent planning and time management are crucial, and not only in this course. Use a calendar to help. Some people love electronic widgets like Google Calendar, and other find

an old-fashioned paper calendar is more effective. Find what works for you, and use it! Start by marking all of the deadlines for homeworks, quizzes and exams. Then block off time in advance to complete those assignments and to study. Look here for tips about creating an effective study plan in college.

- **Work every day**. Chemistry acquisition is easier if you don't cram. It takes time to think through concepts, and working for hours without a break is not effective. Instead, spend a little time each day and take breaks every 20 minutes as you work. You should expect to spend approximately 12-15 hours per week completing activities associated with this class and studying. Use your calendar to keep yourself honest, i.e. to make sure you are really putting in the necessary time.
- **Start Early**. Don't wait until the last minute to start assignments. If you start a quiz shortly before the deadline and have technical difficulties, we can't help you. Similarly, if you wait to start the homework until Thursday night, you may not be able to find someone to answer questions. The instructors do not answer e-mails 24/7.
- **Solve problems**. Learning requires that you do things yourself not just to watch others do them. Reading through a correct answer is not the same as discovering it for yourself. It is not sufficient to read the notes or watch the instructors solve problems. To be successful, you must be able to solve problems yourself.
- **Attend Office Hours**. If you are stuck, ask for help. Faculty and TA office hours can be a tremendous help. Often we can explain something you have missed in only a few minutes. Then you are unstuck, and you have saved yourself lots of time.
- **Form a Study Group**. Research shows that students who study with friends are more successful. There are probably several reasons for this. First, it guarantees that you are actually studying, i.e. you don't put it off. Second, a few heads may be able to explain things in different ways so that things start to click for you.

General ASU Policies

Grade Appeals

Grade disputes must first be addressed by discussing the situation with the instructor. If the dispute is not resolved with the instructor, the student may appeal to the department chair per the University Policy for Student Appeal Procedures on Grades.

Student Conduct and Academic Integrity

Academic honesty is expected of all students in all examinations, papers, laboratory work, academic transactions and records. The possible sanctions include, but are not limited to, appropriate grade penalties, course failure (indicated on the transcript as a grade of E), course failure due to academic dishonesty (indicated on the transcript as a grade of XE), loss of registration privileges, disqualification and dismissal. For more information, see http://provost.asu.edu/academicintegrity. Additionally, required behavior standards are listed in the Student Code of Conduct and Student Disciplinary Procedures, Computer, Internet, and Electronic Communications policy, and outlined by the Office of Student Rights & Responsibilities. Anyone in violation of these policies is subject to sanctions.

Students are entitled to receive instruction free from interference by other members of the class. An instructor may withdraw a student from the course when the student's behavior disrupts the educational process per Instructor Withdrawal of a Student for Disruptive Classroom Behavior.

The Office of Student Rights and Responsibilities accepts incident reports from students, faculty, staff, or other persons who believe that a student or a student organization may have violated the Student Code of Conduct.

Prohibition of Commercial Note Taking Services

In accordance with ACD 304-06 Commercial Note Taking Services, written permission must be secured from the official instructor of the class in order to sell the instructor's oral communication in the form of notes. Notes must have the notetaker's name as well as the instructor's name, the course number, and the date.

Syllabus Disclaimer

The syllabus is a statement of intent and serves as an implicit agreement between the instructor and the student. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. Please remember to check your ASU email and the course site often.

Accessibility Statement

In compliance with the Rehabilitation Act of 1973, Section 504, and the Americans with Disabilities Act as amended (ADAAA) of 2008, professional disability specialists and support staff at the Disability Resource Center (DRC) facilitate a comprehensive range of academic support services and accommodations for qualified students with disabilities.

Qualified students with disabilities may be eligible to receive academic support services and accommodations. Eligibility is based on qualifying disability documentation and assessment of individual need. Students who believe they have a current and essential need for disability accommodations are responsible for requesting accommodations and providing qualifying documentation to the DRC. Every effort is made to provide reasonable accommodations for qualified students with disabilities.

Qualified students who wish to request an accommodation for a disability should contact the DRC by going to https://eoss.asu.edu/drc, calling (480) 965-1234 or emailing DRC@asu.edu. To speak with a specific office, please use the following information:

ASU Online and Downtown Phoenix Campus
University Center Building, Suite 160
602-496-4321 (Voice)

Polytechnic Campus
480-727-1165 (Voice)

West Campus
University Center Building (UCB), Room 130
602-543-8145 (Voice)

Tempe Campus
480-965-1234 (Voice)

Counseling

As a student, you may experience a range of challenges that can interfere with learning, such as strained relationships, increased anxiety, substance use, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may diminish your academic performance and/or reduce your ability to participate in daily activities. ASU Counseling Services offers confidential

professional counseling and crisis services for students, and treatment does work. You can learn more at https://eoss.asu.edu/counseling. Support is always available (24/7) at 480-921-1006.

Title IX

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at https://sexualviolenceprevention.asu.edu/faqs.

As mandated reporters, course instructors (including TAs) are obligated to report any information they become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, https://eoss.asu.edu/counseling, is available if you wish discuss any concerns confidentially and privately.