Chemistry 103: General Chemistry I

Fall 2016

This syllabus provides information that pertains to all sections of Chemistry 103 for the Fall 2016 semester. Section specific schedules and instructor information are provided on the course websites.

Credits:	4
Whole-class meetings:	150 minutes per week, either as three 50 minute or two 75 minute meetings
Discussion meetings:	50 minutes, two times per week
Laboratory meetings:	3 hours, once a week, for ~10 weeks of the semester
Course site:	https://learnuw.wisc.edu (under Fall 2016 courses, find Chemistry 103) Bookmark this course site – it is important to visit daily! It is the hub for our course and contains crucial materials for each day of class.

Course Description

Chemistry is the science of making things and transforming things. Chemistry is often called the central science because it connects so strongly to other sciences, among them physics, biology, engineering, medicine, materials science, and pharmacology. You will have an opportunity through Chemistry 103 to gain a new understanding of the complex world around you, and you will begin to understand how the many elements of the periodic table serve as building blocks of every substance and every process on earth and beyond.

Chemistry 103 will introduce key chemistry concepts, such as stoichiometry and the mole concept, the behavior of gases, liquids and solids, thermochemistry, electronic structure of atoms and chemical bonding, descriptive chemistry of selected elements and compounds, intermolecular forces. It is the first course in a two-semester General Chemistry sequence. The second course is Chemistry 104 and students who take Chemistry 103 should also plan to take Chemistry 104. The 103-104 sequence serves as a prerequisite for advanced courses such as Organic Chemistry and Analytical Chemistry and is required by many other majors (such as

engineering, many biological and agricultural sciences, pre-health professions, and L&S breadth requirements.

The prerequisites for Chemistry 103 are suitable algebra placement score or completion of Math 112, Math 114, Math 171 or equivalent. One year high school chemistry is recommended.

Goals and Learning Objectives

We want you to learn to think like a chemist. With that in mind, this course has been designed and organized to help you learn chemistry. We will do our best to guide you, but no course or instructor can learn for you. Successful students are proactive about their learning and establish patterns of study.

We have two overarching goals for our chemistry program: 1) You will conceptualize the invisible by understanding the atomistic model of matter and the role of energy in transformations, and 2) you will operate as a scientist by learning how to think logically, communicate effectively, and solve problems methodically.

Specific objectives that you will accomplish by the end of this semester are:

1. Students will gain an understanding in a breadth of basic chemical concepts and principles.
2. Students will develop the ability to solve a wide variety of integrative chemistry problems
3. Students will apply submicroscopic models of matter to explain observable macroscopic phenomena.
4. Students will be able to visualize and apply chemical and mathematical models.
5. Students will be able to design, conduct, and analyze experiments safely and successfully.
6. Students will develop the study skills and habits of independent learners.
7. Students will articulate chemical knowledge and understanding in a written context.

Big Ideas

The seven "Big Ideas" will be described in broad strokes at the outset of the semester; these ideas will provide a backdrop to new concepts as they are introduced throughout the semester. Big ideas for entire course:

1. All matter is comprised of atoms; atoms are made of subatomic particles (protons, neutrons, and electrons).
2. Atomic structure and molecular structure affect chemical and physical properties of atoms, molecules, and ions.
3. Forces of attraction / repulsion exist between subatomic particles, between individual atoms, and between molecules; these forces, along with structure, influence chemical and physical properties.
4. Atoms, molecules, and ions are in constant motion and possess kinetic energy; kinetic energy influences how often atoms, molecules, and ions collide into and therefore interact with each other.
5. Chemical bonds and intermolecular attractions can be broken and reformed; equilibrium occurs when these two processes occur at the same rate.
6. Breaking chemical bonds (and/or overcoming intermolecular forces) consumes energy; making bonds releases energy.
7. Climate change is one of the biggest scientific challenges facing the world today; chemistry is central to the solution to this problem.

You will learn more about the learning objectives and big ideas as the semester progresses.

Expectations in our Learning Environment

Chemistry 103 is a fun and enlightening course, and we enjoy teaching it. We owe each other professional behavior and mutual respect. Your instructors will model expected behavior and will refrain from inappropriate activities, such as being late to class, going off on irrelevant tangents, and ending class early. We will devote time and energy to helping you succeed in this class and to providing you opportunities to practice chemistry problem solving.

As partners in learning, we all have responsibilities for every class period. We have prepared an interactive and engaging set of activities for which your pre-class preparation is critical. Each component is important for your success. Do not overlook any of them.

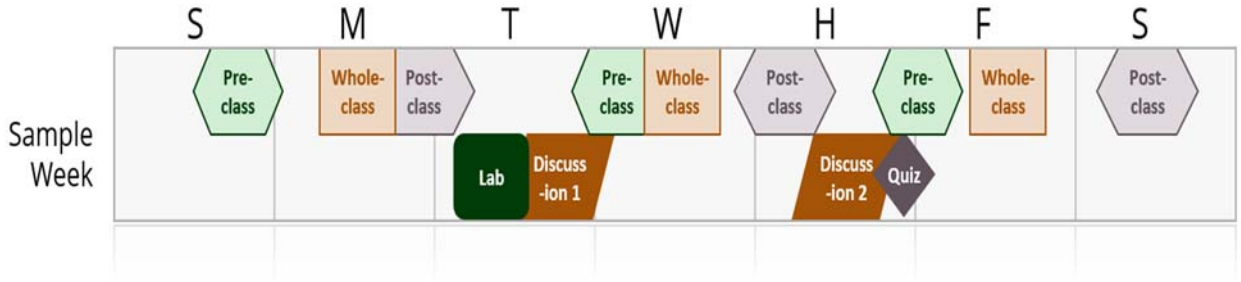
Come prepared to be engaged, present, and active in this environment. Make notes about questions you have or points you don't understand. Come to us with your questions and struggles with the material; that's why we're here.

We know that success in this course depends upon your ability to solve problems. Developing your problem solving skill is a key aim of this course. We will give you a lot of opportunities to practice problem solving. The most successful students devote most of their study time to problem solving. We advise you to practice problem solving every day. In emphasizing problem solving skills, we aim to cultivate your ability to connect these problems to broader chemistry concepts.

We promise that by the end of Chemistry 103, you will be a more mature learner, a stronger thinker, and have a much better grasp of how to think like a chemist. To be successful in Chemistry 103, you must learn to be an independent learner and problem solver.

Course Components

To give you an idea of what a weekly schedule might look like, here is a sample week for a MWF class. Your particular weekly schedule may look slightly different, but these same course components will always be part of your schedule.



Pre-class Activities

Due dates: These activities are due at the start of your whole-class session (example: If your whole-class session meets at 8:50 AM, your pre-class activities are due at 8:50 AM.

Activities include: Readings, videos or demos, interactive tutorials, short quizzes

Whole-class Session

Activities include: Group work, individual and group problem-activities, instructor-led demos, instructor-led content presentation, ConcepTests, and Learning Activities

Post-class Activities

Due dates: These activities are typically due at 8 am each Monday for MWF schedules or at 11 pm each Monday for TTH schedules. Due dates may be adjusted by the instructor, if necessary.

Activities include: OWL homework, problem sets, additional content materials (videos, readings)

Laboratory

Due dates: Labs are due at the end of each lab session, unless announced otherwise. Due date vary, depending on your lab schedule. Please consult the corresponding Semester Schedule page and each Module Overview page to find your lab schedules.

Activities include: designing experiments and interpreting data, using laboratory equipment properly, working with your fellow students in the laboratory, communicating your ideas about the data through discussions and writing (submitting lab reports.

Discussion Sections

Due dates: You will have discussion section meetings twice/week. During one meeting per week, there will be a graded quiz.

Activities include: Group problem-solving work, exam and lab preparation when needed, discussion quizzes

Exams I, II, III, and Final Exam

Due Dates: Exam dates vary depending on your course schedule. If you have a MWF schedule, your exam dates are 10/5, 10/28, and 11/18. If you have a TTH schedule, your exam dates are 10/4, 10/27, and 11/22. Please consult the Semester Schedule on our website to verify your exact exam dates and other crucial course dates.

Course resources

We have chosen course materials that best address the learning objectives and that are the most useful resources to you in your study, lab, and group work. There are seven total materials: one textbook, one lab manual, one lab notebook, safety goggles, Top Hat, a calculator, and OWL online homework access. These items will cost you roughly $200. These items are essential for your learning, and we have negotiated with the publishers to receive highly discounted textbook pricing. Please contact us if you cannot afford these items.

Textbook

The textbook for the course is *Chemistry: The Molecular Science,* 5th edition, by Moore, Stanitski and Jurs. A custom package for UW students is available at the University Bookstore at a reduced price, which includes the e-text and online homework system (OWLv2). You may purchase either the hardcover edition or a less expensive unbound edition. If you prefer, you may purchase only the electronic version (e-text), which includes access to the homework system. The e-text/homework bundle can be purchased at the bookstore for ~$100 or directly from the publisher for ~$80, follow the instructions under "OWLv2 Registration" on the "Getting Started" portion of our Learn@UW page. Note that the paper (hardcover or unbound) textbooks already come bundled with the e-text and homework at no additional charge.

Lab Manual and Notebook

The *Chemistry 103 Laboratory Manual, Fall 2016* and carbonless laboratory notebook can be purchased (Wiscard only) in room 1375 (chemistry computer lab) during the first two weeks of classes and later through the first-floor stockroom. Lab notebooks (with carbonless copies) purchased from the University Bookstore are also acceptable.

Safety Goggles

Industrial quality eye protection is **required** in all chemistry laboratories. Safety goggles that fit over regular glasses can be purchased from the University Bookstore or along with the lab manual and notebook. Contact lenses should not be worn in the laboratory because fumes or splashes may be caught between them and your eye. Please note that sandals are not acceptable footwear in the laboratory.

Top Hat software

The whole-class sessions will make extensive use of student "voting" concept tests, surveys, and other questions. We will be using the Top Hat (www.tophat.com) classroom response system in class. You will be able to submit answers to in-class questions using Apple or Android smartphones or tablets (via the Top Hat app), laptops (via their website), or through text message (tutorial link here). Top Hat is the supported student response tool at UW-Madison, and you may be using Top Hat in multiple classes throughout the academic year.

You can visit the Top Hat Overview, which outlines how you will register for a Top Hat account and provides a brief overview to get you up and running on the system. You can register via the Top Hat website. This registration will cost $16 for one semester, $20 for one year or $54 for life. Follow these directions to set up your account. Your instructor will have a section-specific course code to share with you; use this code to register for your Chem 103 section. Please see the homepage of your course site under Announcements (right side of homepage) to find this code.

Should you require assistance with Top Hat at any time, please contact their Support Team directly by way of email (support@tophat.com), the in app support button, or by calling 1-888-663-5491.

Calculator

An inexpensive calculator capable of calculating square roots, logarithms and exponential operations is needed for this course. The calculator will be used on exams, homework assignments, and in the lab. A programmable calculator may be used as long as no information is stored on it, such as chemical formulas or equations. It must be of the type allowable on an ACT or SAT exams (no cell phone or iPod calculators). You must clear the memory before entering the exam room.

Laboratory Information

The laboratory experiments are a vital part of this course; you will develop skills that are not easily learned or demonstrated in lectures. These skills include:

- Designing experiments and interpreting data
- Using laboratory equipment properly

- Working with your fellow students in the laboratory
- Communicating your ideas about the data through discussions and writing

You must successfully complete the laboratory assignments to receive a passing grade in this course.

Laboratory Preparation

You **must** prepare in advance for each laboratory exercise by writing an introduction and procedural outline in your lab notebook. During the lab period you will carry out the experiment, take notes, and complete your data analysis. All your work **must** be turned in at the end of the period in the form of the duplicate pages from your lab notebook. You will be graded on your pre-lab preparation, in-lab experimental technique and data analysis, and on your note taking skills. Your laboratory report is due at a time specified by your TA/FA, almost always at the end of the laboratory period. Please note that late laboratory reports are not graded.

Laboratory policies

Attendance policy: You must attend all laboratory sessions. There is no opportunity to make up a lab that you miss; a grade of zero will be recorded for unexcused absences. Below are specific attendance details:

Late attendance: Any student showing up to lab 30 minutes late or later is not allowed to participate in lab. This is considered an unexcused absence and students are not allowed to make this up.

Unexcused labs: Any student missing a lab because of late arrival or not showing up at all will NOT have the opportunity to make this up. You may not reschedule a lab period simply to fit your personal schedule. Make-up labs are not scheduled. Exceptions to this policy are made only in unusual circumstances and are at the discretion of the Lab Director.

Excused labs: Students who must miss labs due to University reasons (UW varsity athletics or band) should arrange for a time with their instructor two weeks prior to their scheduled lab date to make up the lab. Students who must miss labs for personal emergencies or illness should contact their TA and instructor as soon as possible to discuss how they can make up the lab. Students who must miss a lab for religious observance should contact their TA and instructor as soon as possible to discuss how they can make up the lab.

Late lab reports: Unless otherwise announced, reports for wet labs are due to TAs/FAs at the end of the lab session, before students leave the lab.

Falling behind during lab time: The laboratory will take a significant amount of preparation time in addition to the time spent in the laboratory. Most of the experiments have been scheduled so that students can finish everything (including the report) required in the laboratory period. However, you may not be able to finish the experiments if you are not prepared when you enter the laboratory. If you regularly fail to finish the experiments, ask your instructor how you can schedule your lab time more effectively.

Grades

Evaluation of your learning

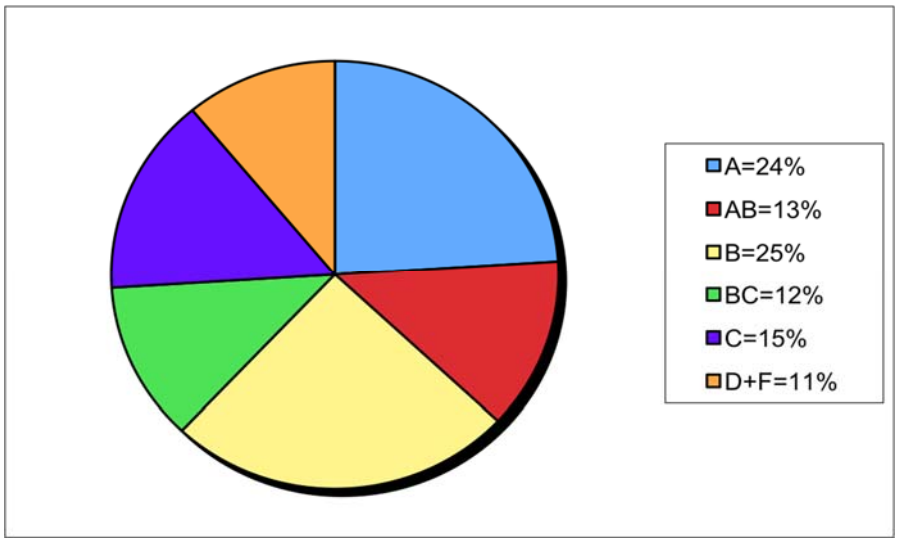
Your scores are always available to you at our Learn@UW course site. There are no opportunities for extra credit. However, students are given a 10% buffer on pre- and post-class assignment scores and a 20% buffer on TopHat scores. This means that if there were a total of 100 possible points for pre-class assignments, for example, the grade would be calculated out of 90 points. Total scores would also be capped at 90 points. For instance, a student earning 75 of the 100 possible points for pre-class activities would have a score of 75 out of 90 (or 83.3%). A student earning 95 out of the possible 100 points would have a score of 90 out of 90, or 100% on pre-class activities.

You must successfully complete the laboratory assignments to receive a passing grade in this course. Course components are weighted as follows:

Three, 50-minute exams	33%
Pre-class activities	7%
Post-class activities (online homework)	10%
Laboratory	20%
Quizzes (in discussion sections)	7%
Clicker participation	3%
Final exam	20%
Total	**100%**

Grade scale

The approximate distribution of final grades is given below. It is important to note that the distribution will be adjusted upwards if class performance exceeds our expectations. For example, we guarantee that at least 24% of the grades will be A, and it may be higher.



Course and UW-Madison Policies

Academic Integrity

We expect all students to conduct themselves with honesty, integrity, and professionalism. Remember that it is not ok to simply copy and paste material from the Web or from another student into your own work. The Writing Center describes how to cite material that is not yours: http://writing.wisc.edu/Handbook/QuotingSources.html. Passing off someone else's lab reports or exam answers as your own work is academic misconduct. Asking a student to “click” concept test responses for you when absent from class is also academic misconduct. Such behavior is not tolerated and is grounds for a failing grade in this course. To learn more about university policies on academic misconduct, see http://www.students.wisc.edu/doso/academic-integrity/.

Accessibility

The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility.

Students are expected to inform their instructor of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. We will work either directly with you or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.

Religious Accommodations

In accordance with regent and faculty policy, instructors should not schedule mandatory exercises on days when religious observances may cause substantial numbers of students to be absent from the university. UWS 22 states that "students' sincerely held religious beliefs shall be reasonably accommodated with respect to scheduling all examinations and other academic requirements." Exams and requirements include any course requirement made by the instructor that will be considered in the course. See "Religious Observances" under the Academic Calendar for more details.

Students must notify the course instructor within the first two (2) weeks of the semester/term of the specific dates conflicting with an exam or assignment. Instructors are also strongly encouraged to make students aware of this policy within the first week of the semester/term. For more details and protocol information, see the UW-Madison policy on religious observance and exam conflicts.

Make-up exams

There are no make-up exams given in this course. If you have a family emergency or other extenuating circumstances that might impact your ability to sit for an exam, please talk to your instructor as soon as possible.

Communications

Office Hours and Help Desk

Your Chemistry 103 instructors are dedicated to maximizing your learning experience. We rely heavily on you to take the initiative in coming to seek our help. In the past, the most successful students took good advantage of office hours on a weekly basis. They came with lists of questions and clearly identified problems that they needed help solving. This engagement led to great discussions and a very effective use of time.

There is a **Chem 103 Help Desk** available to all Chem 103 students, located in the main TA/FA office in Chemistry 1201. This is a drop-in spot for all Chem 103 students to find help from a TA/FA who is staffing the Help Desk.

After the first week of class, we will post on the course website a list of all TA/FA office and Help Desk hours. We encourage you to attend any of them, not just those of your TA/FA.

Email

In order to help bring your email to our attention, please include **Chemistry 103** in the subject line of all email messages. Content questions should be directed to your teaching assistant or discussed at your office hours. Emails to your lecture instructor should be limited to logistical questions, concerns about grades, requests for alternate office hours, or any non-content related course questions.

Chemistry 103 Topics and Schedules

A list of modules, assigned readings, and laboratory experiments for all Chemistry 103 sections is provided on the next page. More specific details for each module can be found on the course websites. Specific dates for the modules, quizzes, exams and labs can be found on the top of the Learn@UW course site under "Semester Schedule".

Course Topics

Module Number	Module Title	Number of Class Periods	Assigned Readings (textbook and online)
1	Introduction and Measurement	2	Chapter 1, PDF readings
2	Atoms, Elements, Molecules and Ions	3	Chapters 1, 2
3	Chemical Compounds and Reactions	3	Chapter 3
4	Stoichiometry	3	Chapters 2-4; PDF readings
5	Kinetic Theory	4	Chapter 8; PDF readings
6	Thermochemistry	4	Chapter 4; PDF readings
7	Nature of Energy	5	Chapter 5; PDF readings
8	Chemical Bonding	2	Chapter 6
9	Molecular Geometry	4	Chapter 7
10	Intermolecular Forces	2	Chapter 9
11	Phases	3	Chapter 9

Laboratory Experiments

Citizenship in the Lab
Solutions, Density, and Graphing
Reaction Types and Chemical Logic
Zinc and Iodine
Synthesis of an Alum
Solution Calorimetry
Light, Color, and Solutions
Molecular Geometry and WebMO
Project Lab
Window on the Solid State