

Chemistry 104: General Chemistry II

Fall 2017

Course site: <https://learnuw.wisc.edu> (under Fall 2017 courses, find Chemistry 104)

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.

Why take Chemistry 104?

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. Chemistry 104 is the second-semester course for the two-semester General Chemistry sequence at UW-Madison. In Chemistry 104 students will build on concepts from Chemistry 103 as they explore characteristics of chemical reactions related to chemical kinetics, chemical equilibrium, acid/base and organic chemistry, thermodynamics, and electrochemistry.

What are details of this course?

Chemistry 104 is a 5-credit course taught in a blended environment where there are both in-person and online formats. In-person contact time per week includes 150 minutes of whole-class session meetings, 50 minutes of discussion meetings, and (most weeks) 180 minutes of laboratory. Online work per week includes approximately 3 hours of pre-class and lab preparatory work, 3 hours of post-class homework, and up to an additional 6 hours problem solving and exam study time (per UW-Madison credit hour guidelines).

The prerequisites for Chemistry 104 are completion of Chemistry 103, suitable algebra placement score or completion of Math 112, Math 114, Math 171 or equivalent. One year high school chemistry is recommended.

The course textbook is *Chemistry, The Molecular Science 5th Edition*, (2015), by Moore and Stanitski. A custom package for UW, available at the University Bookstore or directly from the publisher, includes the e-text and online homework system (OWLv2). You may purchase either the hardcover edition or a less expensive unbound edition.

How does this course fit with your preparation for your major?

The Chemistry 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).

Chemistry 104 goals and course 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.

By the end of Chemistry 104, you will:

1. Gain understanding in a breadth of basic chemical concepts and principles.
 2. Develop the ability to solve a wide variety of integrative chemistry problems.
 3. Apply submicroscopic models of matter to explain observable phenomena.
 4. Visualize and apply chemical and mathematical models.
-

5. Design, conduct and analyze experiments safely and successfully.
 6. Develop the study skills and habits of independent learners.
 7. Articulate chemical knowledge and understanding in a written context.
-

Chemistry 104 learning environment

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-session preparation is critical. Each component is important for your success. Do not overlook any of them.

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 104, 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 104, you must learn to be an independent learner and problem solver.

The components of Chemistry 104 are:

Pre- and post-class activities on course site

Purpose: To serve as the organizational hub for all activities in the course and prepare for in-person sessions during the week.

To support your success, Chem 104 instructors will:

- plan effective activities and experiences in the course site that will help you learn key chemistry concepts and wrestle with misconceptions.

To be successful, you will:

- check the course site daily and complete the assigned activities in advance of the whole-class sessions.
 - work the OWL problems daily, keep track of where you are
-

	<ul style="list-style-type: none"> ● provide timely feedback to guide your learning. 	<p>having problems, and bring your questions to your discussion sessions.</p>
<p>Whole-class sessions Purpose: To interact as a whole class to engage with key chemistry concepts, clear up misconceptions, tackle challenges, and make connections.</p>	<p>To support your success, Chem 104 instructors will:</p> <ul style="list-style-type: none"> ● focus on the big concepts and how current material builds on previous ideas. ● work through sticking points, misconceptions, and common challenges. 	<p>To be successful, you will:</p> <ul style="list-style-type: none"> ● attend and engage in all sessions, actively participate in the activities. ● complete necessary readings, activities, and LMS components before each session and be sure to let us know if you do not understand a concept or have a question.
<p>Discussion sessions Purpose: To practice problem solving, reinforce whole-session concepts, ask questions, make mistakes, and to learn from your peers in a small-group environment.</p>	<p>To support your success, Chem 104 TAs and FAs will:</p> <ul style="list-style-type: none"> ● provide structured opportunities for peer group work and collaborative problem solving. ● apply the concepts, clarify any misunderstandings, and deepen your understanding. 	<p>To be successful, you will:</p> <ul style="list-style-type: none"> ● arrive ready to share ideas, make mistakes, learn from your TA/FA and your peers, and collaboratively problem solve. ● participate in discussion activities and proactively make a list of questions based on challenges you encountered during your attempts to solve problems.

<p>Labs</p> <p>Purpose: To explore principles of chemistry in a laboratory environment, learn basic laboratory skills, conduct experiments, and test hypotheses.</p>	<p>To support your success, Chem 104 TAs, FAs, and lab instructor will:</p> <ul style="list-style-type: none"> ● provide you the opportunity to explore chemical transformations in a hands-on environment. ● teach you the basics of safe and effective laboratory manipulation. 	<p>To be successful, you will</p> <ul style="list-style-type: none"> ● come to laboratory prepared, actively participate in the activities, and work collaboratively with your lab partner to conduct the experiment. ● effectively document the experiment in your lab notebook and the post-lab write-up.
<p>Problem-solving sessions (done on your own)</p> <p>Purpose: To construct knowledge collaboratively, give and receive crucial feedback, share ideas and correct misconceptions, and help support each other in learning chemistry.</p>	<p>To support your success, Chem 104 instructors will:</p> <ul style="list-style-type: none"> ● design effective peer work activities and provide time for peer group work. ● facilitate problem-solving sessions and provide guidance. 	<p>To be successful, you will:</p> <ul style="list-style-type: none"> ● attend all problem-solving sessions and fully participate. ● use these sessions as opportunities to teach each other and to learn from each other.
<p>Quizzes</p> <p>Purpose: To provide practice opportunities with exam-like material and concepts so that you get feedback on your understanding prior to exam dates.</p>	<p>To support your success, Chem 104 instructors will:</p> <ul style="list-style-type: none"> ● provide quizzes that promote good problem-solving study strategies and allow for discussion with peers. ● provide timely and clear feedback to help you prepare for your exams. 	<p>To be successful, you will:</p> <ul style="list-style-type: none"> ● prepare for quizzes thoughtfully and thoroughly by working a number of chemistry problems. ● use quiz sessions as an opportunity to clear up misconceptions and learn from your peers and TA/FA.

<p>Exams</p> <p>Purpose: To evaluate and provide feedback on the state of your understanding of chemistry concepts and their applications.</p>	<p>To support your success, Chem 104 instructors will:</p> <ul style="list-style-type: none"> ● provide practice exams with their answer keys and write exams that are fair and accurately reflect the content. ● provide timely and clear feedback on your exam. 	<p>To be successful, you will:</p> <ul style="list-style-type: none"> ● accurately and completely record your work on the exam during the exam. ● Prepare well in advance for the exam by solving a large number of problems, learning from each one. ● review your exam to identify any gap areas in your knowledge and skills and make a plan to reinforce your knowledge in these areas.
<p>Individual and small-group study (done on your own)</p> <p>Purpose: To connect chemistry concepts, build problem-solving skills, and develop the study skills and habits of independent learners.</p>	<p>To support your success, Chem 104 instructors will:</p> <ul style="list-style-type: none"> ● identify the key topics for your independent study. ● highlight additional resources to guide your study. 	<p>To be successful, you will:</p> <ul style="list-style-type: none"> ● work a sufficient number of problems until you can easily, correctly, and repeatedly demonstrate their concepts and applications. ● teach each other and learn from each other.

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. [Please see Module 0 on our course site](#) for a list of the

materials and options for purchasing the textbook/homework at a significant discount:

<https://learnuw.wisc.edu> (under Fall 2017 courses, find Chemistry 104)

Chemistry 104 schedule

A link to our course schedule, including exam dates, can be found on the course site under "Semester Schedule" and in Module 0. You must report any religious conflicts with exams or laboratory exercises to your TA/FA within the first two weeks of classes.

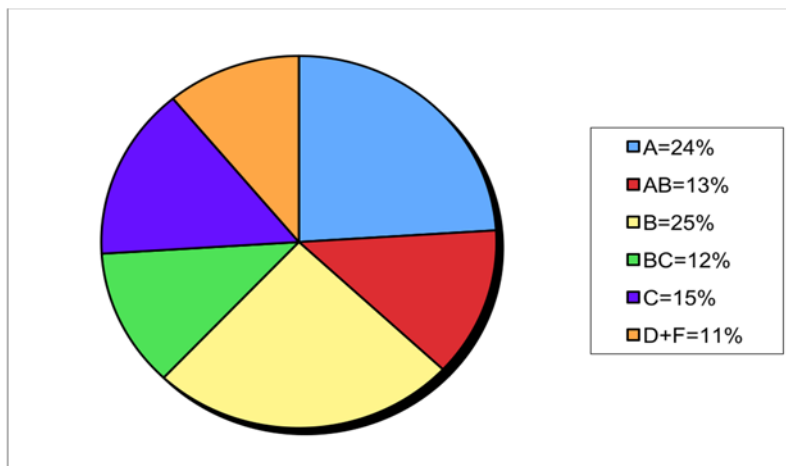
Evaluation of your learning

Your scores are always available to you at our Learn@UW course site. There are no opportunities for extra credit. **You must successfully complete the laboratory assignments to receive a passing grade in this course.**

Three, 75-minute exams	33%
Pre-class activities	7%
Post-class activities (online homework)	10%
Laboratory	20%
Quizzes (in discussion sections)	7%
Top Hat participation (ConcepTests)	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.



Expectations in our learning environment

Chemistry 104 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 we will devote time and energy to helping you succeed in this class and to providing you opportunities to practice chemistry problem solving. In return, you will need 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. To succeed, you must practice chemistry problem solving every day! Please be prepared to commit 8 to 12 hours outside of class each week toward this effort.

[See Module 0 on our course site for more information on course expectations and helpful tips for maximizing your learning.](#)

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/>.

Reasonable Accommodations

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.

Communications

Your Chemistry 104 instructors are dedicated to maximizing your learning experience. We rely heavily on you to take the initiative in coming to seek our help. After the first week of class, we will post a list of all TA/FA office hours, and we encourage you to attend Chem 104 Help Desk hours (listed on our course site).

Piazza

We will be using the Piazza discussion tool to ask and answer questions. Start by searching to see if anyone has already asked the same question. If you can't find a similar question, post your question and then check back frequently to see responses from other students, the course TAs, and the instructor.

Email

In order to help bring your email to our attention, please include **Chemistry 104** in the subject line of all email messages that you send us. Email should be limited to logistical questions, concerns about grades, requests for alternate office hours, or any non-content related course questions. Content questions should be directed to Piazza or discussed at your instructor's/TA's office hours.

[More policies, expectations, and details in Module 0 on our course site.](#)

Student contract

I have read the syllabus and understand the expectations of this Chemistry 104 learning environment.

I understand that I am expected to contribute to a productive atmosphere, to show respect to my peers, to be responsible for my work and my preparation for deadlines, and to ask for clarification when I need it. I expect to participate fully in an engaging learning experience in Chemistry 104 and to optimize the learning opportunities available to me. Finally, I will contribute to positive classroom etiquette by:

- 1) being seated before the bell rings,
- 2) refraining from packing up until after the class is over, even if the bell has rung (this will not happen often), and
- 3) using my phone for Top Hat only during class, not texting or checking my phone for other reasons.

[You will be asked to agree to this contract in Module 0 on our course site.](#)

Chemistry 104 Topics and Schedules

A list of modules, assigned readings, and laboratory experiments for all Chemistry 104 sections is provided below. More specific details for each module can be found on the course websites

Module Number	Module Title	Number of Class Periods	Assigned Readings (textbook and online)
1	Fundamental Organic Chemistry	3	Chapter 10
2	Chemical Kinetics	4	Chapter 11
3	Chemical Equilibrium	3	Chapter 12
4	Acids and Bases	3	Chapter 14
5	Additional Aqueous Equilibria	3	Chapter 15
6	Thermodynamics	3	Chapter 16
7	Electrochemistry	3	Chapter 17
8	Nuclear Chemistry	2	Chapter 18

Laboratory Experiments

Molecular Structure

Synthesis of a Biodiesel

Kinetics 1

Kinetics 2

Chemical Equilibrium & LeChatelier's Principle

Esters and Amides

Acid and Base Solutions

Titrations

Chemical Equilibrium & Thermodynamics

Electrochemical Cells