

Chem 177 Spring 2021

This document is a duplicate of the online syllabus and course calendar for Chem 177 taught by William Jenks, as of January 13, 2021. Small updates may have been made and you are encouraged to check the online syllabus.

Instructor

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- Webex office hours 10 am Monday and 3 pm Thursday or by appointment

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Jon will run problem session recitations, answer questions, and handle items like early exams or potential homework extensions.

General Information

This course covers principles and quantitative relationships, stoichiometry, chemical equilibrium, acid-base chemistry, thermochemistry, rates and mechanism of reactions, changes of state, solution behavior, atomic structure, periodic relationships, chemical bonding.

Course prerequisites: MATH 140. or high school equivalent, and CHEM 50 or 1 year high school chemistry, and credit or enrollment in CHEM 177L. Chemistry, chemical engineering, and biochemistry majors may consider taking CHEM 201.

This is an online course for Spring 2021, which will run entirely through Canvas.

The information in this syllabus is subject to change in extenuating circumstances. Changes to the course syllabus will be provided in writing and announced via course-wide announcements.

Chemistry 177 is corequisite with its laboratory section, Chemistry 177L. You will not be allowed to complete Chem 177 without also completing or having previously completed Chem 177L (or 177N or 201L). Anyone doing so will receive grade of F for Chem 177, regardless of performance in the course.

Course Format

The course has certain dated expectations in conjunction with the 10th Edition of Chemistry by Zumdahl, Zumdahl, and DeCoste. A digital copy of the textbook is provided at reduced cost via the Immediate Access Program at Iowa State University. For purposes of formatting, learning objectives, and modules, we will follow the structure of the first 10 chapters of Zumdahl. Each of 10 modules will contain material related to the learning objectives in that chapter, including lecture videos, quizzes, homework, and Module test. Each module has a fixed due date, with the Module Quiz only available within the 24-hour window of the due date. Students are encouraged to collaborate on homework and all studying activities but are required to work alone on the Module tests and the Final Exam.

All quizzes and the final exam are open book and open note. However, it is clearly considered academic misconduct to use answer sharing sites, such as (but not limited to) Chegg.com, Scribd.com, and Coursehero.com. Just don't do it! Evidence that answers come from such sites will be treated as evidence of misconduct.

Help resources (including course orientation and the like) will be detailed elsewhere in the Canvas course page.

Due Dates and Course Structure

The course consists of 10 modules corresponding to the 10 chapters that we cover in the Zumdahl Chemistry textbook. The textbook reading corresponds to the name of the module.

Each module contains videos and mini-quizzes that correspond to each video. These are very short and intended just to ensure you look at the videos and pick up the main concepts, like TopHat (clicker) questions would be for an in-person class. It also contains the required online homework and the graded Module/Chapter test.

All items in a given module have the same due date (on a Wednesday) except for the chapter test, which will be on Fridays at 10 am. Obviously, you are advised to watch the videos, do the mini-quizzes, and do the homework well in advance of the due date!

Also given in each module are high quality supporting/supplementary material that you are strongly encouraged to take advantage of. These include curated external videos and ISU-produced demonstrations, along with a few humorous items.

Communication Guidelines

- General announcements will be sent using the Canvas Inbox.

- Be sure to properly configure your Notification settings in order to receive timely notifications from Canvas.
- For any Questions or Concerns related to the course content, please use the following ways:
- Post a question to the Questions and Answers discussion. The forum is monitored; a response will be provided within 24 hrs on a weekday and 48 hrs during the weekends. Your peers might also have the answer to your questions. If you know how to answer the question, go ahead and make a posting too. You can ask to clarify assignment details, assignment due dates and your muddied points about new content. Do not post questions about or prompts for your quizzes and other assessments.

Netiquette

- All communication within the course should adhere to university standards of Netiquette at ISU. Specifically, communication should be scholarly, respectful, professional, and polite.
- You are expected to follow ISU's Principles of CommunityLinks to an external site..
- You are encouraged to disagree with other students, but such disagreements need to be based upon facts and documentation. It is my goal to promote an atmosphere of mutual respect in our interactions. Please contact me if you have suggestions for improving the interactions in this course.
- Professional and respectful tone and civility are used in communicating with fellow learners and the instructor, whether the communication is by electronic means or by phone or face-to-face.
- Video interactions reflect a respectful tone in verbal communications and body language.
- Use correct spelling and grammar.

Online Presence

In your role as an online student, you are in charge of the following:

- Your timing: log into the course when it is convenient for you, however, make sure that you are engaging and contributing, as you would in the face-to-face settings.
 - Personal accountability: practice time management and figure out how you learn best. If you need help figuring out these things, try connecting with your peers, ask a classmate to become your study buddy or contact the instructor.
 - Following the course's schedule. Become familiar with the way the To Do list works in Canvas (Links to an external site.) to help you stay organized.
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Course Goals and Learning Objectives

Chem 177 is the first semester of a two-semester introduction of chemistry. It is NOT designed as a standalone one-semester introduction of chemistry. Students seeking a one-semester general chemistry course are advised to take Chem 163, 167, or 201 instead. Taking only the first semester of this course is a little like taking "US History" and stopping at Reconstruction. Although General Chemistry is relatively modular, the modules from both semesters are designed carefully to work synergistically to give a rounded view of the science.

Upon completing this course, students will be able to do the following:

- Solve chemical problems based on scientific data, using algebra and unit conversions as needed, using graphical or tabulated data as needed, and with a reasonable understanding of accuracy and precision.
- Describe fundamental components of chemical structures through use chemical nomenclature and terminology, use chemical symbols and formulas, You will understand atomic and small molecule structure
- Explain the fundamental features, using balanced chemical equations and descriptions of heat/enthalpy absorbed by or released by the system
- Use those features to predict stoichiometric quantities such as expected yield (expressed in mass, moles or molecules), limiting reagents, observed percent yields, etc.
- Explain the central role of energy in chemical reactions: (a) define the enthalpy of a reaction and explain its measurement using calorimetry; (b) translate energy implications of reactions using Hess's Law; (c) calculate energy implications of/for reactions using any of the above.
- Describe and compute concentrations of solutes and carry out stoichiometric computations for aqueous solutions of certain important classes of reactions, such as acid/base neutralization and precipitation reactions.
- Describe the relationship between pressure, volume, and temperature for an ideal gas. Explain how an ideal gas differs from a real gas. Make reasonable assessments about which conditions or gases will behave more ideally than others. Do stoichiometric calculations on ideal gases.
- Explain how the kinetic theory of gases relates temperature, molecular velocity, pressure, etc.
- Describe atomic structure and its importance in understanding chemistry: (a) explain the use of absorption and emission spectroscopy in understanding the quantized nature of orbital energies; (b) relate atomic orbitals to the shape of the periodic table; (c) relate certain fundamental properties of atoms and elements to their position on the periodic table.
- Explain the origin and implication of chemical bonding: categorize ionic vs covalent bonds; polar vs non polar bonds.
- Draw models of localized bonding via Lewis structures and appropriate resonance forms and predict/explain single, double, and triple bonding
- Predict the shapes of molecules

- Explain the difference between a localized model of covalent bonding and the molecular orbital theory of covalent bonding, applying the latter to understand the properties of some simple molecules.
 - Describe the fundamental characteristics of molecules and molecular bonding: (a) produce Lewis structures and appropriate resonance forms; (b) describe models for molecular shapes, hybridization, molecular orbitals, and multiple covalent bonds.
 - Explain the concept of intermolecular forces and describe the properties of the compounds in the solid, liquid, or gas phase using these concepts.
 - Use phase diagrams to predict phase changes in compounds brought about by changes in pressure or temperature.
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Course Materials

Required materials - These are the minimum resources you must take advantage of to be successful in this course

- An electronic (or hard) copy of Zumdahl's Chemistry
- An online homework account through Cengage's "OWL 2"
- Lecture videos and associated quizzes provided online
- Chapter/module notes prepared for this course and provided online

Optional materials

Each module will indicate optional materials, many of which are videos that have been carefully selected to be helpful and/or provide supplementary instruction that will enrich your experience. These materials do not have mini-quizzes associated with them but may be very helpful in rounding out your view of the chapter material, learning how to solve problems, etc.

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Learning Activities

To successfully complete this course, you do the following for each module:

- Download and read the lecture notes. This serves as a great introduction to the videos and text chapter and our points of emphasis
- Watch all the assigned (and - I recommend - the optional!) videos and complete the associated mini-quizzes..there are two for each module...and you get two chances for each one. They are learning opportunities!
- Read the chapter in detail.

- Do the online homework/problems. Much of first year chemistry is material that you can really only truly digest by forcing yourself to work through problems. The assigned homework is a baseline minimum and additional ungraded problems are available to you.
- Review your written materials as needed during the problem and after.
- Participate in discussion topics.
- Complete the module/chapter test on the assigned day/time.

Assessments

The mini-quizzes and homeworks are due on Wednesdays, with the chapter/module tests two days later, i.e., Friday at 10 am. You should NOT wait to the end to do these, but we set this as the deadline.

The one exception is that for Week 1, we have set the mini-quiz and homework deadline to be just before the Friday test.

Lecture Quizzes (10% of total)

For each module, there are two 5-question quizlets, which are primarily meant as formative (teaching) tools. You take the first one after watching the first 2-3 videos and then the second at the end. The settings on these quizzes will include having two chances for each question, so it is expected that most students will score very well on these...and you can look up the answers you might have missed in between your two chances. Your score on this section will be the percentage of correct answers. For a 1000-point course, this is out of 100 points.

Online Homework (10% of total)

The online homework system is a valuable learning tool. Although it is not perfect, the questions themselves are pretty darn good. The settings on the homework are meant to be non-punitive, so you can get essentially all the points if you actually work them through with some patience. We readily acknowledge that the time you spend on the homework will probably be disproportionate to the points. The points are really there to nudge you to do them! The reward for doing the homework well will come from doing well on the Module tests. Your score on this section will be the percentage of correct answers, again equivalent to 100 points out of 1000.

Module/Chapter Tests (60% of total)

In a traditional in-person chemistry course, you would probably have four midterms and a final. For this online version, we are instead having a Module test associated with each

Chapter/Module (and a final). You will have an hour to complete each Module tests, though they probably will not take you that long. You will keep the best 8 out of 10 scores, so that you are allowed to have a bad day, get sick, etc., once or twice throughout the semester. Each Module test will focus on the material from the module, but will also assume a reasonable understanding of the previous material. The scaling effectively makes each Module test worth 75 points if you think of the course being worth 1000 overall. Your score is the total percentage of your best 8 tests, scaled up to 600. Module tests must be worked alone but are open book and note.

Final Exam (20% of total)

The course is completed with a comprehensive final exam. This exam will be very comparable to a traditional final exam. The modular nature of the instruction doesn't mean it's not important to be able to put concepts together! Out of a 1000 point course, the final would be worth 200 points. The Final Exam must be worked alone, but is open book and note.

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Grading Scheme

The instructor will use a scale that takes into consideration an overall class performance, however, the following grade cut-offs will be guaranteed.

Overall Grade (% Score): A(≥ 92), A-(≥ 90), B+(≥ 86), B(≥ 82), B-(≥ 79), C+(≥ 75), C(≥ 70), C-(≥ 67), D+(≥ 62), D(≥ 58), D-(≥ 50), and F(< 50).

Reporting Errors

Despite our best efforts, occasionally mistakes survive our editing process. If you believe there is an error in your Canvas Gradebook or in an assigned quiz/test, or answer, please send an email to the TA and instructor. It is a prerogative of the student to confirm the accuracy of their grades and to report errors encountered within 7 days after the grades for homework, quizlets, and module tests are posted.

Students also occasionally run into problems with browsers, service interruptions, or other related matters that may require technical assistance. If you have a problem of this sort in the midst of an exam or such that it causes you to miss a deadline, email the TA and instructor immediately. However, for general technical assistance of the Cengage site, please see their technical support (on the module page or while you are there) first.

Supplemental Instruction (SI)

The materials for these sessions are solely prepared by the SI Leader. Students are encouraged to attend the SI sessions to ask questions about course content and to develop learning/study strategies. For information about the days, times, and locations for SI sessions, refer to the SI website.

Course Policies

Feedback

The vast majority of quizzes and homework are graded automatically and essentially instantaneously. If questions are added that require human intervention, grading will be completed within 7 days of the due date.

Missed and late coursework

It is important to keep up with the pace of this course, therefore no late course work will be accepted. Rare extensions may be granted under extenuating circumstances, entirely at the discretion of the instructor. Extensions are more likely to be granted if you approach the instructor in advance, or very promptly after, by presenting reasonably acceptable documentation.

Attendance

This course is offered asynchronously. You are to turn things in on time and complete the Midterm Quizzes by the due date. There are no attendance requirements, but we strongly urge you to attend the scheduled problem sessions given by the TA (Thursdays) and office hours (Monday and Thursday) held by the instructor via Webex.

Missed Midterm Quizzes

There will be no after-the-fact make up quizzes given. The "best 8 out of 10" policy is meant to offset the possibility of short term illness or emergencies. If you must take the Chapter/module test EARLY, due to reasonably documented absence, please email the TA and instructor so the instructor can determine if arrangements can be made for you.

Other Policies

This course will adhere to university policies on accommodations, inclusiveness, academic integrity, prep week (formerly "dead week"), and so on, as described here. Certain specifics are described below.

Accommodations, Harassment, Discrimination

ISU is committed to assuring that all educational activities are free from discrimination and harassment based on disability status. Requests for accommodations documented through SAS will be honored if presented well in advance to your instructor. Assistance can be obtained through SAS at 1076 Student Services, www.sas.dso.iastate.edu Links to an external site., accessibility@iastate.edu, or 4-7220. Reasonable accommodations will be made for conflicts due to religious practices if requests are made well in advance.

Academic Integrity

You are welcome to work on graded homework together and participate in study groups. This said, behaviors such as actually logging onto another student's account and providing answers are considered academic misconduct. You must work alone for Module tests and the Final Exam. Similarly, the use of answer sharing sites, such as Chegg.com, Coursehero.com, or scribed.com is also considered academic misconduct, even though exams are broadly open-book. If you are caught cheating on a Module test or Final exam, the lightest possible consequence will be an undroppable zero for that exam; all violations will be reported to the Office of Student Conduct at the Dean of Students office.

First Amendment Protections

Iowa State University supports and upholds the First Amendment protection of freedom of speech and the principle of academic freedom in order to foster a learning environment where open inquiry and the vigorous debate of a diversity of ideas are encouraged. Students will not be penalized for the content or viewpoints of their speech as long as student expression in a class context is germane to the subject matter of the class and conveyed in an appropriate manner.

Course Schedule

Free, very good advice

Chemistry doesn't have to be that hard but it is not a course that you can "wing it." You should work on Chem 177 almost every day and you are doing it wrong if you are pushing the deadlines to turn in the mini quizzes or homework. The required homework is really sort of a bare minimum. If you totally cruise through it, that's great. But if you struggle, you need to allow yourself more time to go to help sessions, do the optional homework, etc etc.

Questions about the course calendar should go in the Administrative Questions and Answers Discussion as your first resort (and look there to see if someone else asked!) because we have several hundred students, and if something is unclear to you, it's probably unclear to a number of people.

You are always welcome to work ahead, within reasonable limits based on our Module releases

Module release

Modules will be released in the following chunks, which relate to their topic groupings:

- Modules 1 and 2. right away
- Modules 3, 4, 5, and 6: Feb 1
- Modules 7, 8, and 9: March 17
- Modules 10: April 19

Please note that end-of-chapter tests will be administered only at a specified period of time. The normal time is Friday at 10 am on the specified day. You will count your best 8 scores, no matter how many of them you take. This is intended to provide a combination of two instances where you could have a bad day or be sick and it is not our intention to give extensions for the tests unless there are truly exceptional circumstances.

Module format

Every module has the following

- A chapter in the text. There is no explicit link in the module...just go to the text and read the appropriate chapter.
- A Set of written lecture notes meant to supplement and clarify yours. Many of the illustrations in the videos are contained in the notes.
- A page with 4-6 Lecture videos that we consider mandatory viewing (though there is no actual check to make sure you have done it). This page also has a series of Supplemental

readings and videos. They are not mandatory, but were chosen to be helpful and sometimes give you some broadened perspectives on the topic.

- Two “mini-quizzes” that are meant to make sure you have taken a look at the videos and gotten a couple of the major concepts. You get two chances at these (and the questions won’t change!), so you should take them as you go...don’t save them for the due date!
- One mandatory homework set from OWL. These are the “mastery” sets and they represent a bare minimum of problem-solving work you should do to prepare for the end-of-module tests.
- One completely optional and ungraded set of extra homework problems that are designed purely for you to have the opportunity for extra practice. They are called the “End of Chapter” or “EOC” problems by the publisher. Feel free to bounce around and do the ones you think you need to work on. This is a class where almost everyone will benefit from extra homework problems.
- An end-of-module test. This will be administered at a specified period of time.

Everything in a given module is due on the due date. It should be obvious that you would be wise to have all the materials except the end-of-module test done before the due date, but we decided not to impose a specific schedule on you.

Module Calendar

Notes:

Wednesday is the day that homework and mini quizzes are due completed. (The one exception is chapter 1, for which the homework and mini quizzes are due right before the test on Friday at 10 am.)

Friday (two days later) at 10 am is the chapter test. If this is a conflict for you, please contact the TA and Instructor immediately to arrange for an earlier test time.

Modules 1 and 2

Available now

These are largely introductory material on measurements, units, significant figures and the basics of the atom which are designed to prepare you for the main portion of the course.

- Chapter 1: Everything due by 10 am Jan 29. Test at 10 am Jan 29.
- Chapter 2:
 - Homework and mini quizzes Feb 3
 - Chapter test 10 am Feb 5

Modules 3, 4, 5, 6

Available Feb 1

These chapters are mainly “mass balance” part of the course, where you balance reactions, deal with moles, determine limiting reagents and yields, figure out volumes and concentrations of solutions, and then do the same kinds of things for the gas phase. Chapter 6 accounts for “energy balance” by introducing concepts of heat and enthalpy and how they are measured. They involve a fair amount of algebra and will give you a chance to practice your “word problems” skills. You’re advised to make sure you are very confident of your problem-solving skills and to do some of the optional EOC homework problems.

- Chapter 3: 2 weeks! Make sure you do some extra problems! THAT is why you get two weeks!
 - Homework and quizzes Feb 17
 - Chapter test 10 am Feb 19
- Chapter 4
 - Homework and quizzes due March 3
 - Chapter test 10 am March 5
- Chapter 5
 - Homework and quizzes due March 10
 - Chapter test 10 am March 12
- Chapter 6
 - Homework and quizzes due March 17
 - Chapter test 10 am March 19

Modules 7, 8, and 9

Available March 17

These chapters are the most theoretically demanding of the course. The underlying derivation and theory is something we come back to in Chem 324, but you will learn about quantization of light and the energy of the electron, as well as about the basics of bonding in molecules and molecular geometry. You’ll want to do the problems here, but they move away from being “applied algebra” and become more concept-based.

- Chapter 7:
 - Mini quizzes and homework due March 31
 - Chapter test 10 am April 2.
- Chapter 8: Due Monday, November 2
 - Mini quizzes and homework due April 7
 - Chapter test 10 am April 9

- Chapter 9: Due Friday, November 6
 - Mini quizzes and homework due April 21
 - Chapter test 10 am April 23

Module 10

Available April 19

This chapter deals with an introduction to solids, but we focus more on phase changes. There is a bit on vapor pressure (related to chapter 5) and some more on heat and enthalpy (related to chapter 6).

- Chapter 10
 - mini quizzes and homework due April 28
 - Chapter test 10 am April 30

Final Exam

The final exam is comprehensive. The due date will be announced at a later date.