

Syllabus for CHM 203: General Chemistry I

MWF • EPLY 107 • 9:30–10:45 AM (D) • 11:00 AM–12:15 PM (G) • 12:30–1:45 PM (I) • Fall 2018

<http://freitag.creighton.edu/CHM203>

Instructor: Dr. Mark Freitag
email: freitag@creighton.edu
office: Hixson-Lied Science Building 263

Office Hours: Monday: 8:00–9:30 AM, 2:00–4:00 PM
Tuesday: 10:00 AM–4:00 PM
Wednesday: 8:00–9:30 AM, 2:00–4:00 PM
Thursday: 8:00–11:00 AM, 12:00–4:00 PM
Friday: by appointment

I *will* be in during scheduled office hours, but I am more than happy to see you anytime you find me in the office. You are also welcome to schedule an appointment; just send an email.

Block Time Usage. We have 75 minutes every MWF for use in this course. On lecture days, there will be a 10 minute question-and-answer period at the start of class. Lecture will then begin and continue for approximately 50 minutes. If there is any time remaining after lecture, we may have a short quiz over the book problems that were assigned in the previous lecture. If there is no quiz, you are welcome to stay in the room until the end of the 75-minute period to ask more questions or work problems. On exam days you will usually have the full 75 minutes to work on the exam. The only exception is the first exam, which is a one-chapter ‘half exam’; for that one, you will have 50 minutes to work.

Textbooks/Hardware. McMurry, J.; Fay, R.C.; Robinson, J.K. *Chemistry*, 7th Ed.; Prentice Hall: New Jersey, 2016. You will also need a **non-programmable** (e.g., non-graphing) scientific calculator that can evaluate exponentials (e^x , 10^x) and logarithms ($\ln x$, $\log x$). *You will not be able to use programmable calculators on any exam or quiz in any section of general chemistry lecture or laboratory.*

Introduction/Attendance. CHM 203 is taught in multiple sections with a different instructor wholly responsible for their section(s). The problems and exams in my sections will be different from those in other sections, so it is best to see me first if you have questions or concerns. Attendance will not be monitored, but you are responsible for all information given in lecture, even if you are not present. CHM 203 and CHM 204 are co-requisites, which normally means they must be taken at the same time. In the extraordinarily unlikely event

of a cancelled class, I will notify you via your Creighton University email. Of course, if the *University* is closed—usually for weather-related issues—we will not have class and no special announcement will be made.

Course Objectives. Students will be able to:

- evaluate and comment on the accuracy, precision and the propagation of error in measurements.
- convert correctly between different units of measurement.
- identify and count the number of subatomic particles in isotopes and calculate average atomic mass.
- recognize stoichiometric relationships, relate quantities of reactants and products in a balanced chemical reaction and calculate yields.
- write correct names and formulas for ionic, acid and binary molecular compounds.
- classify and balance acid-base, precipitation and reduction-oxidation reactions, while also considering the dissociation of ionic particles in solution.
- characterize atomic orbitals and connect the construct of the periodic table to elementary quantum theory.
- predict electron configuration of atoms and ions using the periodic table and identify periodic trends of atomic and ionic properties.
- draw Lewis (electron-dot) structures correctly.
- utilize VSEPR theory to predict molecular geometry, polarity and intermolecular forces.
- calculate work and enthalpy changes for chemical processes.
- explain the behavior of gases and calculate some physical quantities using the ideal gas approximation.

- relate the physical properties of solids, liquids and gases to the interactions between particles.

Problem Sets. Once a reasonable proportion of the class has demonstrated competency on the homework by satisfactory quiz performance, problem sets will be assigned instead. The problem sets are meant to be an opportunity for you to learn something, and are *not* intended to be an evaluation of what you know. (That's what the exams are for.) Since I am happy to help you with them, *there is no excuse for getting a low problems grade*. If you get stuck on any part of the problem, come and see me and we'll get you over whatever hurdle has blocked your progress. If you get stuck again, come back. Believe me, there is nothing more frustrating than banging your head against the wall for hours on end only to find that you've made a simple mistake someplace. Instead, bang your head for 15 or 20 minutes, then come see me. (I'm quite serious here—it will be much more beneficial to you if you make a reasonable effort at solving the problem yourself first.)

If your problem sets are insufficiently legible, I will ask you to type them up using a word processing program with an equation editor. (Failure to do this as requested will result in a point deduction.) If you can't write well by hand, you will need to learn how to use these programs efficiently if you're going to be successful in college and beyond.

You may work together on the problems if you wish. For some people, these group discussions are a critical part of the learning process; others prefer to work alone. If you work with others, be careful: in the group setting, you can help each other understand the problem and its solution, but *I don't want to see identical solutions*. Once you understand the problem and the basic technique required to solve it, work out the details on your own. I will not grade identical or nearly identical problem sets.

Problem sets are due at the beginning of lecture on their due date. It may happen that you forget to bring it one day; these things happen. Therefore, I will accept assignments until **3:00 PM** on their due date; half of the points will be deducted for each day they are late. For example, if you turn in your problem set at 3:01 PM, it has lost half its value. It will lose the other half at 3:01 PM the next day. If that seems harsh, remember: it is already late! The extension to 3:00 PM is a *grace period* that should only be used under excep-

tional circumstances. You are allowed one grace period per semester. If you turn in a problem set after 3:00 PM, the set is late *and* you forfeit any unused grace period.

Detailed solutions to the problem sets will be posted on the course BlueLine site at 3:00 PM (hence the firm deadline). Be sure to use these solutions to check your work, as it will take me about a week to carefully grade and comment on all the problem sets and return them.

Exams. Exam questions will fall into one of two general categories:

Lecture: These are mostly multiple-choice questions based on the material presented in lecture, but there may be ideas from the homework as well. These may include definitions (which are very important), proofs, derivations, or the explanation of conceptual ideas. You'll want to be thinking through your lecture notes regularly to prepare for these questions.

Homework: These problems will be very similar to the assigned book problems from each lecture. You should be getting the vast majority of points on these questions because you've seen them before and you've had time to think about them in detail and *ask questions*. If you're not doing well on these problems, it is a clear sign you need to re-evaluate your approach to the material.

If you look at the exam from 2017 that is posted on the BlueLine course website,* you'll see that some of the questions may require a few words of explanation; can you *clearly* communicate what you know? At this level, understanding the ideas is only half the battle (well, maybe 85% of the battle); you also must be able to communicate what you know clearly and effectively. Therefore, you will be graded on this aspect of your work as well. Sloppy, sketchy, but arguably correct work will not earn full credit. I do not have the luxury of assuming that you understand a particular idea; you need to *demonstrate* that you understand the idea.

The exam dates are given in the *Course Timeline* section below. Plan on taking the exam on the given date. I will make other arrangements if you have an officially excused absence for University-sponsored events cleared with the Dean's office. If for any reason you cannot make it at the scheduled time, you must contact me at least one week before the exam. This does not necessarily mean that your absence will be excused, but if you fail to notify me in advance, you will not be able

*This exam is posted so you can get a feel for my style of writing questions and general exam expectations. Do **not** think of it as a 'practice exam', as I make a point of generally not repeating questions from the previous year if I can help it.

to reschedule the exam under any circumstances. Of course, emergencies and unforeseen circumstances will be considered on an individual basis. (“*I couldn’t find a babysitter,*” and “*I don’t feel well*” aren’t emergencies—car accidents, snowstorms, sudden illnesses that require a doctor’s visit, and other acts of God are.)

Exams are written under the assumption that the student has reasonably mastered the material. For those who have not, the exams may be difficult to complete in the allotted time. The exams will focus on the material covered in the chapters listed with each exam in the *Timeline* below. **Absolutely NO cell phones/watches or programmable calculators are allowed.** If you are seen with either during the exam for any reason, you will receive a zero for that exam. This penalty is applicable for all other electronic devices except a non-programmable calculator. You will not be permitted to leave the room once the exam has started, but you may leave when you are finished.

Grading.

Item	Points	% of Course
One ‘half’ exam (Exam I)	50	8%
Four exams, 100 pts each	400	61%
Quizzes and problem sets	110	17%
Comprehensive final exam	100	15%
Total	660	

Your quiz/problem set score will be scaled so that it is always worth 20% of the exam points that have been completed to date. At the end of the semester, this means that each problem set ‘point’ may actually be worth more or less than an exam point, since we will likely have something other than exactly 110 problem set/quiz points. Your lowest quiz score will be dropped; if you miss one for any reason, that will be your dropped score. Other than the items listed above, there are no additional sources for points in this course.

If you believe you have found a grading error, you may submit the item for regrading for a period of three days after it has been handed back.

Determining Letter Grades. I do not have strict, pre-determined cutoffs for letter grades; instead, I look for natural breaks in the distribution of course scores. However, the actual cutoffs will be within a few percentage points of the following:

A	B+	B	C+	C	D
91%	87%	80%	76%	68%	60%

These cutoffs are never increased. Course grades are rounded to the nearest whole number. To move on to CHM 205 this spring, you must get a C or better in this course. Creighton University defines letter grades as follows:

- A** *outstanding achievement and an unusual degree of intellectual initiative*
- B+** *high level of intellectual achievement*
- B** *noteworthy level of performance*
- C+** *performance beyond basic expectations of the course*
- C** *satisfactory work*
- D** *work of inferior quality, but passing*
- F** *failure—no credit*

Notice that satisfactory work is reflected in the C grade. I am therefore not alarmed (but I am disappointed) if the average grade in the course is a C. On the other hand, I’d be quite thrilled if everyone demonstrated ‘*outstanding achievement and unusual degree of intellectual initiative*’ and I could give all As. You may ask about your grade over email, but because of privacy issues I can only reply if you send your question from your Creighton University account. If you sign the FERPA waiver, I will send you grade reports after each exam up to the course withdraw date, and after that by request.

Extra Help. If for some reason you can’t stop by my office, send an email. I should be able to reply fairly promptly, especially on weekdays. (Occasionally, emails sent to me from a non-Creighton account are held up by the University’s spam filter. In that case, I will probably never see it. Your best bet is to use your Creighton account.) To request an appointment to see me outside of office hours, send an email. I tend to email the class over the course of the semester; all emails will be sent to your official Creighton University account, so you should get in the habit of checking it regularly.

Christian Hannah, a senior chemistry major, will be holding Attached Tutoring sessions as part of a program in the Academic Success office.[†] The times and location(s) of these sessions will be announced. He will also be attending lecture and will be posting his lecture notes to the course BlueLine website. I will also post my

[†]The Academic Success office is located in the lower level of the Reinert-Alumni Memorial Library (the EDGE office); see <http://blogs.creighton.edu/edge/academic-success/>

own detailed course notes on the Blueline site for those who need to miss lecture for legitimate reasons.

I've set up a website[‡] with more tips on getting help, and links to other outside resources. There is a link to this site on the main course page. There is also a solutions manual for the textbook problems (and the odd-numbered end-of-chapter problems) on reserve in the Reinert-Alumni Memorial library. Be sure to ask for Dr. Freitag's sections of CHM 203.

Academic Honesty. The College of Arts and Sciences has an established policy on academic honesty; you can read about it at your leisure.[§] In addition to the specific items mentioned there, academic misconduct includes representing the work of another to be your own, tampering with the experiment of another, defacing or tampering with library or student materials, or facilitating dishonesty on an exam. If you are found guilty of academic misconduct, you will receive a zero for the activity. Don't do anything dumb.

Parting Thoughts. Don't procrastinate, and don't be lazy. If you feel yourself falling behind, please come and see me even if you can't identify a specific problem. I should be able to tell where you're at progress-wise. If I think you're doing fine, I'll say so. If not, we'll try to figure out how to get you back up to speed. Take advantage of the resources that are available (myself, tutors, posted notes, etc.). If you require some other form of assistance, please don't hesitate to ask. If you sincerely want to learn, I want to help.

A final suggestion: unplug. Technology can be a good thing, but it can also be a mindless distraction and—despite its potential for the opposite—a lonely, detached waste of time. When it comes to technology, exercise prudence: just because you can do something electronically doesn't mean it's the best way to do it. Also exercise temperance: if you can't go two minutes without fiddling with your smartphone, leave Precious at home. While you're on campus, allow yourself the time and silence to simply think.

Course Timeline. The calendar below is a tentative timeline and list of topics and readings for the course. Some of the dates and coverage may shift. For an updated topic calendar, see the course website.

MONDAY	WEDNESDAY	FRIDAY
20 August	22 Course Introduction: Syllabus	24 Chemistry and Measurement
27 Significant Figures	29 Unit Conversions	31 Early Chemical Laws and the Atom
3 September Labor Day – No class	5 Exam I: Ch. 1 (50 pts/50 min)	7 Nomenclature of Simple Molecular and Ionic Compounds
10 Chemical Equations, Molar Mass, and Avogadro's Number	12 Mass of the Holy Spirit – No class	14 Stoichiometry, Limiting Reagent, and Reaction Yield
17 Percent Composition and Empirical Formulas	19 Solutions and Molarity	21 Exam II: Chs. 2–3
24 Precipitation and Acid–Base Reactions	26 Solution Stoichiometry and Titrations Introduction to Redox Reactions	28 Oxidation Numbers, Redox Titrations, and the Activity Series
1 October A Prelude to Quantum Mechanics	3 Bohr's Theory of the Hydrogen Atom	5 De Broglie, Heisenberg, and Schrödinger

[‡]<http://freitag.creighton.edu/guide/help.html>

[§]https://www.creighton.edu/fileadmin/user/CCAS/curriculum/CCAS_Academic_Honesty_Policy_.pdf

MONDAY	WEDNESDAY	FRIDAY
8 Atomic Orbitals and the Aufbau Principle §5.8–12	10 Periodic Properties §5.13–14	12 Exam III: Chs. 4–5 21
15 Fall Break – No class	17 Fall Break – No class	19 Fall Break – No class
22 Ionization Energy and Electron Affinity §6.1–6	24 The Ionic Bond and Lattice Energies §6.7–8	26 The Covalent Bond §7.1–5
29 Lewis Structures and Formal Charge §7.6, 8–10	31 Molecular Shapes: The VSEPR Model §8.1	2 November Hybrid Orbitals §8.3–4
5 Molecular Dipoles and Intermolecular Forces §8.5–6	7 Molecular Orbital Theory §8.7–8	9 Expansion Work, the First Law, and Enthalpy §9.1–5
12 Exam IV: Chs. 6–8	14 Thermochemical Equations and Calorimetry §9.5–7	16 Calculating Enthalpy Changes §9.8–10
19 The Ideal Gas Law §10.1–4	21 Thanksgiving Break – No class	23 Thanksgiving Break – No class
26 Dalton's Law of Partial Pressures §10.5	28 The Kinetic Theory of Gases §10.6	30 Phase Changes and the Clausius–Clapeyron Equation §11.2–3
3 December Exam V: Chs. 9–10	5 The Solid State §11.4, 6, 8	7 Ionic Solids and Phase Diagrams §11.7, 9

Comprehensive Final Exam
Tuesday, 11 Dec 2018, 3:30–5:30 PM
Location TBD