UM CHEMISTRY 141 COLLEGE CHEMISTRY I
AUTUMN 2016

Lead Instructor
Professor Mark S. Cracolice, CHEM 101B, mark.cracolice@umontana.edu

Office Hours
MWF 8:30–9:30 AM and by appointment, CHEM 101. I am frequently available outside of office hours. Walk in the outer 101 door (no need to knock). Please come in 101B any time the inside door is open.

Electronic Reserve
This syllabus and keys for quizzes and midterm exams are posted on Moodle.

Prerequisites
ALEKS Placement Level 4 or M 095 Intermediate Algebra w/ C– or better. You must have the ability to use algebra to solve "word problems" and analyze laboratory data. Whether or not you have taken and passed algebra courses, the prerequisite for this course is the ability to *use* algebra as a problem-solving tool. If your algebra skills are weak, you should consider putting off CHMY 141 until you get up to speed. You should be eligible to enroll in M 121 or higher satisfy the math prerequisite for this course. Additionally, if it has been some time since you took high school chemistry (≥ 3 yr), or if your high school chemistry course was not rigorous, or if you did not take high school chemistry, you should give serious consideration to taking CHMY 104 before you take CHMY 141 (see discussion of CHMY 104 below).

Course Purpose and Objectives
An introductory survey of chemistry. We follow the standard curriculum in the United States, as suggested by the American Chemical Society. This is the first semester of a two-semester sequence. The sequence provides an introduction to the principles of physical and inorganic chemistry appropriate for the level of knowledge necessary for students who plan on majoring in the health sciences, engineering, or the sciences. A major theme of the course is to introduce you to the chemist's view of the universe, with an emphasis on making connections between the macroscopic and the particulate levels of matter. Students taking CHMY 141 generally have majors that require two years or more of chemistry. CHMY 221–223 is a two-semester sequence in organic chemistry that is typically taken after CHMY 141–143, and thus concepts from organic chemistry are only touched upon lightly in the course.

The teaching staff has three overarching goals with respect to your intellectual development:

1. **Development of your scientific reasoning skills.** In other words, we will work to help you with the development of your ability to think, specifically with respect to those thinking patterns commonly used by scientists. Chemists often use skills such as mathematical pattern recognition, the development and manipulation of mental models of particulate-level phenomena, and proportional, probabilistic, combinatorial, and correlational thinking. As mentioned in the prerequisite section, please note that fundamental algebraic skills are assumed to already be in place in this course. Our job is to help you link algebra and general chemistry.

2. **Development of your content knowledge.** This is knowledge of facts, models, laws, and other information associated with chemistry.

3. **Development of your understanding of the nature of science.** We want you to understand that science is a process of developing causal questions, proposing explanations, planning a test of the proposed explanation and predicting the result, and drawing conclusions about the natural world based on the observed results.

Course Topics and Learning Outcomes
The topics to be covered and the learning outcomes for this course are given in detail in the textbook.

Required Materials
Cracolice, M.S., & Peters, E.I. (2016). *General Chemistry: An Inquiry Approach Part I: Lessons 1–39 Autumn 2016–Spring 2017 Version.* Boston, MA: Cengage Learning. The course textbook (the authors do not receive royalties for sales of this textbook).

Cracolice, M. S. (2016). *Think Out Loud! Part I. Autumn 2016–Spring 2017 Version.* Boston, MA: Cengage Learning. The lecture workbook (the author does not receive payment for sales of this supplement).

A nonprogrammable, single-line display scientific calculator. You may *not* use a programmable calculator or one that displays more than one line of information for exams and quizzes in this course. Use this calculator while doing homework so that you get familiar with it.

A *Molecular Model Set for General and Organic Chemistry*. Most students need a model set to learn how to visualize molecules in three dimensions. Unless you have a talent for creating a mental three-dimensional image from a two-dimensional sketch, I strongly recommend the purchase of a ball-and-stick model set. It will not be needed until late in the semester, but the bookstore usually runs out early, and if you try to order one near the point in the semester at which we need it, they typically cannot get it in on time. I recommend that you get one now. It also can (and should) be used next year in organic chemistry.

A spiral-bound college-lined (or grid-lined) paper notebook. Consistently doing the homework is the key to success in this course. An organized homework notebook will provide you with a mechanism to get feedback on homework-like quiz and exam questions. Bring your homework notebook with you to Team Education workshop and when you attend office hours.

A pack of 40 or more 3×5 index cards. You will use these to summarize each lesson by writing concept definitions, problem-solving approaches, data to be memorized, etc., for each lesson. Use them to study for the comprehensive final exam in both CHMY 141 and 143.

Recommended

Eubanks, L.T., & Eubanks, I.D. *Preparing for Your ACS Examination in General Chemistry*. Examinations Institute, American Chemical Society. A study guide for the final examination.

Kean, E., & Middlecamp, C. (1986). *How to Survive and Even Excel in General Chemistry*. McGraw-Hill.
A book that focuses on how to learn chemistry. An excellent supplement if you want to improve your study skills.

Any of the top selling general chemistry textbooks such as: Kotz, Treichel, & Townsend (Cengage), Brown, LeMay, & Bursten (and others) (Prentice Hall), Ebbing (Houghton Mifflin), Chang (McGraw-Hill), or Zumdahl (Cengage).
An alternative perspective on the same topic is often needed to cement your understanding of a concept.

Peters, E.I., & Scroggins, W.T. (1992). *Chemical Skills, 2nd edition*. McGraw-Hill. A supplementary book with a different perspective on the course material. A good source of additional practice problems, as well as a source of mathematical review. (This book is out of print, but you may be able to get a used copy, should you so desire.)

The course consists of three components: lecture, laboratory, and Team Education workshop.

Lecture

MWF 2:00 PM–2:50 PM, ULH 101. Each lecture begins with a ten-minute quiz based on the homework assigned in the lecture immediately prior. The remainder of the period is used to introduce new material, generally using *Think Out Loud!* and working with your peers and your PLTL leader.

Laboratory

A list of laboratory sections and times may be found on CyberBear. All labs are in CHEM 401. Details about the laboratory are covered in a separate syllabus. Prof. Adams is the laboratory coordinator; he supervises the laboratory instructors. You will meet your laboratory instructor—typically a graduate student in Chemistry or Biochemistry—at the first laboratory meeting.

Team Education Workshop

A list of workshop sections and their times and locations may be found on CyberBear.

Team Education is a method of instruction that involves well-trained peers: undergraduate students who have done well in the course previously who undergo pre-instruction training and continuous training throughout the semester. It is designed to actively engage you in the process of learning chemistry, with the help of your team. In addition to gaining content knowledge, both declarative and procedural, Team Education is designed to improve your Thinking and Reasoning Competencies and your Interpersonal Competencies, as defined below by the Association of American Medical Colleges (www.aamc.org):

Thinking and Reasoning Competencies

Critical Thinking Uses logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems.

Quantitative Reasoning Applies quantitative reasoning and appropriate mathematics to describe or explain phenomena in the natural world.

Scientific Inquiry Applies knowledge of the scientific process to integrate and synthesize information, solve problems and formulate research questions and hypotheses; is facile in the language of the sciences and uses it to participate in the discourse of science and explain how scientific knowledge is discovered and validated.

Written Communication Effectively conveying information to others using written words and sentences.

Interpersonal Competencies

Service Orientation Demonstrates a desire to help others and sensitivity to others' needs and feelings; demonstrates a desire to alleviate others' distress; recognizes and acts on his/her responsibilities to society, locally, nationally, and globally.

Social Skills Demonstrates awareness of others' needs, goals, feelings, and the ways social and behavioral cues affect peoples' interactions and behaviors; adjusts behaviors appropriately in response to these cues; and treats others with respect.

Cultural Competence Demonstrates knowledge of social and cultural factors that affect interactions and behaviors; shows an appreciation and respect for multiple dimensions of diversity; recognizes and acts on the obligation to inform one's own judgment; engages diverse and competing perspectives as a resource for learning, citizenship, and work; recognizes and appropriately addresses bias in themselves and others; interacts effectively with people from diverse backgrounds.

Teamwork Works collaboratively with others to achieve shared goals; shares information and knowledge with others and provides feedback; puts team goals ahead of individual goals.

Oral Communication Effectively conveys information to others using spoken words and sentences; listens effectively; recognizes potential communication barriers and adjusts approach or clarifies information as needed.

Evaluation for the purpose of establishing a course grade is based on:

Grading Distribution

Midterm Examinations	40%	Final Examination	30%
Laboratory	14%	Quizzes	14%
Team Education Workshop	2%		

Midterm Examinations

Four midterm exams are given on the Thursday evenings specified in the calendar, 5:00 PM–6:45 PM. Each midterm exam is comprehensive, covering all material in the course to that date. Exams generally consist of twelve questions, with one question each from (a) older material, (b) laboratory, and (c) workshop, and nine questions from the newer material. Students who have a conflict with the evening exam may take the exam 7:30 AM–9:15 AM on the morning of the exam date. To take the morning exam, submit a 3×5 card with the following information to me in lecture on the Wednesday one week before the exam: (a) name, (b) lab instructor, (c) workshop leader, (d) brief description of the nature of the conflict with the evening exam, and (e) name and phone number of person who can verify your conflict. If you qualify for the morning exam, you will receive a permission/conduct form with the location by Wednesday of the week of the exam.

Final Examination

The final examination is given on the date and time specified by the registrar, Thursday 15 December 1:10 PM–3:10 PM. The exam is a standardized exam developed by the American Chemical Society. It is a 70-item multiple-choice instrument. Your raw score on this exam is converted to your final exam score based on a conversion curve that I have established based on historical performance at UM and national norms. The final is mandatory; you will be assigned a grade of F for the course if you do not take the final exam, regardless of your point total prior to the exam.

Laboratory

The total number of laboratory points is multiplied by [140/(total lab points)] in the calculation of your final grade. The details of laboratory grading are outlined in a separate document.

Quizzes

Each lesson in *Think Out Loud!* ends with a reading and homework assignment from the textbook. The homework questions should be the primary focus of your study. At the *beginning* of each lecture, a ten-minute quiz will be administered with questions drawn from the textbook reading, programmed text examples, *TOL!,* and/or homework questions. In general, when a lesson focuses on numerically-oriented concepts, the quiz question(s) will be a homework question with the compounds and/or numbers changed. When the lesson is more conceptually oriented, the quiz question(s) will be derived to test your grasp of the concepts from the reading. Each quiz is graded on a five-point scale. Make-up quizzes are not administered. To allow for illness, emergencies, and other legitimate reasons to miss class, only the best 28 quizzes are used in the calculation of your final grade, for a total of 140 points.

Team Education Workshop

Each workshop is graded based on preparation, attendance, and participation. You will receive 2 points for coming to workshop prepared and then participating actively, 1 point if you do not come prepared or do not make any significant contribution while attending, and no points if you do not come prepared and do not attend and participate in the entire workshop session. The best 10 workshop grades are used in the calculation of your final grade, for a total of 20 points.

Grading Distribution

The laboratory, homework, and workshop actually count for *much* more than the 30% that it may first appear. An actual percentage calculation is not possible because all course components are integrated, but keep in mind that every exam contains laboratory, homework, and workshop questions.

Grading Philosophy

An A student is someone who can solve homework-like problems under exam conditions with near-100% accuracy, who conceptually understands laboratory and workshop and can demonstrate that understanding through the correct solution of application questions on exams, and who can successfully solve novel problems on exams.

A B student is someone who can solve homework-like problems under exam conditions with near-100% accuracy, who conceptually understands laboratory and workshop and can demonstrate that understanding through the correct solution of application questions on exams, but struggles with novel problems on exams.

A C student is someone who can solve most homework-like problems under exam conditions, who conceptually understands laboratory and workshop and can demonstrate that understanding through the correct solution of most application questions on exams, and has a demonstrable understanding of the major concepts of the course.

A D student earns a passing grade. Thus a demonstrated understanding of the major concepts of the course is required. This includes the ability to solve most homework-like problems on exams and quality work on laboratory reports and in workshop.

A student who cannot demonstrate an understanding of the major concepts of the course through their performance on exams, laboratory reports, and in workshop does not earn a passing grade.

Grading

4	Midterm Exams	@ 100 points =	400 points
1	Final Exam	@ 300 points =	300 points
1	Laboratory Score	@ 140 points =	140 points
28	Quizzes	@ 5 points =	140 points
10	Workshop Evaluations	@ 2 points =	20 points
Total			**1000 points**

A+ Not awarded at UM	A 930–1000 points	A– 900–929 points
B+ 870–899 points	B 830–869 points	B– 800–829 points
C+ 770–799 points	C 730–769 points	C– 700–729 points
D+ 670–699 points	D 630–669 points	D– 600–629 points

(600 or more required for CR for those using CR/NCR option)

F 0–599 points

Make-up Exams, Quizzes, Workshops

No make-ups are allowed. In a class of this size, there is no possible way to fairly design special make-up exams for individual students. Students who miss exams for legitimate emergencies or illnesses will be allowed to replace one midterm score with the final exam score. If circumstances are such that you have to miss two or more midterms, it is unlikely that you have been able to learn the major concepts of the course. See me about a medical withdrawal. Only the best 28 quiz scores and best 10 workshop scores are used in the calculation of your course grade to allow you to be excused from missed quizzes or workshops because of special circumstances such as emergencies and illnesses.

Midterm Exam Grading Standards

Midterm exams are graded on a 100-point scale by a process I call “modified multiple choice.” The philosophy is to establish a general pattern for grading that can be consistently and fairly applied to an exam that is scored by a number of graders. The typical grading criteria for an eight-point calculation question are:

8 points	Solution setup clearly and correctly shown, correct answer and sig figs
4 points	Solution setup clearly shown but with one error
0 points	Two or more errors in the solution setup

Additionally, one point is subtracted for any of the following: (a) significant figures error, (b) calculational error, (c) not showing unit cancellation or omitting units. Questions worth 4 points or less are generally graded 4 = correct, 0 = one error or more, with the additional subtractions above on otherwise correct clearly-shown solution setups.

Not all questions will fit this pattern. Nonetheless, you hopefully can understand the general philosophy from this example. 50% or more of the possible credit is reserved for solutions that clearly show a correct understanding of the answer. 50% of the credit is awarded to answers that have one error in the solution process. No credit is given for answers with no work, a difficult-to-follow solution setup, or those with two or more errors. Errors include "dumb mistakes" as well as not-dumb mistakes, whatever those are. We treat missing a 10 mm = 1 cm conversion factor equally with missing any other conversion factor. Learn the fundamentals well! In all cases, the lab instructors will establish grading criteria for their questions and apply them consistently among all exams.

Quiz and Midterm Grading Errors

When quizzes or midterm exams are returned, please check your quiz or exam for grading errors promptly. The answer key is posted the day following the quiz or exam at the course electronic reserve website. Barring emergencies, quizzes are returned at the next class meeting and exams are returned by the Monday following the exam. If you believe that a grading error has occurred:

(a) On a piece of lined notebook paper or using a word processing program, divide the paper into two columns. In the left column, write the correct solution setup to the question, using no more than one line per step. In the right column, rewrite your solution setup, matching each step in the correct solution. Annotate your solution setup with an explanation of your error. In general, for six- or eight-point questions, one error should be awarded half credit, and two or more errors are awarded no credit. Any error on a 4-point question should be scored zero. One point is also subtracted for calculational or significant figure errors, or not showing units and/or unit cancellation.

(b) Attach the page to the front of your unaltered exam. Regrade requests for *quizzes* go to your *workshop leader.* Suspected *midterm exam* grading errors must be submitted to *me in class* no later than one week after your graded exam is returned. Regrade requests are returned to the original grader, who will explain in more detail why their original assessment was correct or s/he will adjust your grade if an error did occur. Graders are allowed to adjust your grade up or down or make no adjustment.

In the rare case where there is more than one suspected grading error, use two separate sheets, one for each suspected error.

Change in Perspective from High School to College

If you consider both your probable lack of college-level study skills (simply due to lack of experience) and the difficulty level of the course material, you will most likely find this to be the most challenging course you will experience in college. Advanced courses are more difficult, of course, but you will develop skills as you mature as a student that will put you in a better position to deal with the more advanced courses. The standard formula for out-of-class time for college courses schedules two hours out of class for each hour in class for an average student. Given that this is a 5-credit course, as a minimum, you should schedule 10 hours per week of study time. If you wish to earn an A or a B in this course, you should schedule 15 hours per week or more outside of class. The exact number of hours largely depends on your previous preparation and the development of your scientific reasoning skills; only you can judge. The distribution of your time is also important. You will maximize the probability of learning the course material well and therefore being rewarded with a good grade by studying two to three hours each day, everyday, rather than cramming all 15 hours per week of study time into a couple of days.

CHMY 104: Preparation for Chemistry

Although not a required prerequisite for the course, CHMY 104 is specifically designed to prepare students for CHMY 141. If you did not pass the chemistry diagnostic exam, you should start in CHMY 104. If you marginally passed the diagnostic exam, you probably should start in CHMY 104. If your algebra skills are weak, you should start with the appropriate math course(s) and then take CHMY 104 before CHMY 141. CHMY 141 is offered in the Spring Semester, and CHMY 143 is offered in the Summer Semester, putting you back on track for CHMY 221 in the subsequent Autumn Semester.

Dropping the Course and Changing Grade Option

Monday 19 September is the last day to drop by CyberBear (5:00 PM). Dropping on or before this date results in NO RECORD of taking this course on your transcript. This is also the last date to change your grade option to AUDIT.

Monday 31 October is the last day to drop with the approvals of your advisor and the course instructor. Dropping between 20 September and 31 October results in a grade of W on your transcript.

After 31 October, you have effectively made the decision to stay in the course until the end. After this date, you must have documented justification of a circumstance beyond your control to drop the course. In addition to the

written external proof of your claim, you have to acquire the approval of your advisor, course instructor, and dean of your major. Here are the guidelines on what the CHS Dean's office historically has regarded as appropriate verification:

1. Medical. *Memo from physician or other medical professional.*
2. Change in work schedule. *Memo from employer with pertinent information.*
3. Family/personal emergency. *Memo from appropriate professional.*

If this is the case, submit your completed drop petition *and a copy of the documentation* to me immediately before or after class in the lecture hall. If you have less than 50% of the possible exam points on that date, you will be assigned a WF grade; if you have more than 50% of the exam points to date, you will be assigned a WP grade.

Any time during the semester up to **12 December** (the last day of classes before finals week), you may change your grading option between traditional and credit/no credit (by petition; your advisor must also approve). (The audit option cannot be selected after **19 September.**) Your choices are:

1. Traditional letter grade. Details are given elsewhere in this syllabus.

2. Credit/No Credit grading. A freshman or sophomore with a GPA of 2.00 or better may elect one undergraduate course a semester on a credit/no credit basis. Juniors and seniors may elect more than one credit/no credit course a semester. No more than 18 CR credits may be counted toward graduation. *If you choose the CR/NCR option in this course, it will not count toward General Education Requirements.* The credit/no credit option does not extend to courses required for the student's major or minor, except at the discretion of the department concerned. CR and NCR grades do not affect grade point average. The University cautions students that many graduate and professional schools and some employers does not recognize non-traditional grades or may discriminate against students who use the credit/no credit option for many courses. Additionally, the option is often problematic for students who transfer to another institution.

Why do Biology Majors and Health Professions Majors Need 2+ Years of Chemistry?

The general course objectives can be summarized in one phrase: to introduce you to the way chemists study the universe. All health science and biology curricula require, to some degree, an understanding of chemistry, and this is because the separation between chemistry and biology is rapidly being eliminated. The critical component of the chemist's approach to studying the universe is the consideration of the particulate nature of matter. The cell, the old standard for the basic unit in biology, has now been replaced with a more fundamental basic unit, the molecule. In this course, we introduce you to this building block of all living (and nonliving) things.

Disabilities

If you are a student with a disability who will require reasonable program modifications in this course, please meet with Disability Services for Students in Lommasson 154 for assistance in developing a plan to address program modifications. If you are already working with Disability Services, correspond with me by email and/or arrange to meet with me during my office hours to discuss reasonable modifications that may be necessary. For more information, visit the Disability Services website at http://www.umt.edu/disability.

Legal Notices

This course syllabus is *not a contract;* it is a tentative outline of course policies. Changes may be made before, during, or after the semester at my discretion.

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the university. All students need to be familiar with the Student Conduct Code. The Code is available for review online at http://www.umt.edu/vpsa/policies/student_conduct.php.

Frequently Asked Questions

All I did was put 10 centimeters = 1 meter and I lost 50% of the points for a five-step problem. Is that correct?
Yes. "Stupid error" flaws and "smart error" (?) flaws are treated equally. It pays to know the fundamentals, and it costs not to know them. A patient who is administered a medication dosage that is "just" off by a factor of ten is a dead patient. A bridge that is too weak to handle a weight load "just" off by a factor of ten is an engineering catastrophe.

I failed the first three exams, and now the drop date has past. Can I petition to drop because of my failing grade?
Make your drop decision by the drop date, **31 October.** You cannot drop after the deadline to elect to drop simply because you are failing the course. See the criteria for dropping past the deadline.

I study all of the time for this course, but I still can't do better than a C on the exams. How can I improve my grade?

The Kean and Middlecamp book has a number of suggestions on improving your study efficiency. I strongly suggest that you work through it in its entirety early in the semester and then review the most pertinent sections throughout the semester. They are the world's experts in the *process* of learning chemistry, and I can not provide you with better advice than theirs.

I am failing a lot of quizzes. Should I drop the course?
The best predictor of your grade early on in the course comes from your first eight quiz scores. In Autumn 2013, we found that a quiz average of 50% was the cutoff between students likely to pass and those unlikely to pass. If you maintain an average of over 50% on the first eight quizzes, you are very likely to pass the course, and if your quiz average in this first quarter of the course is below 50%, you are very likely to fail the course. It doesn't get any easier than the introductory material, and subsequent material depends on understanding the material in the first 1/4 of the course. If you choose to stay in the course, you need to make radical changes in your study habits. Keep in mind that not only will you have to find more time to study for this course, but you will also have to find additional time to make up for the deficiencies of the first few weeks. The course content is cumulative. It's your decision, but recognize that you need to do something different if you want to succeed. A lot of help is available, so take advantage of it to review from the beginning of the course if you do choose to work to recover.

But I'm a special case because I'm _____. I need to take the exam on _____.
I can not write a separate make-up exam for each student with special circumstances. It takes me approximately one entire work day to write an exam. Even if I had an "extra" day to write an exam just for you, it wouldn't be fair because it would not be at an equivalent difficulty level. You can take the exam when it is scheduled, early by permission, or you cannot take it.

Why won't you consider my special circumstances?
The primary criterion that I use to guide my decisions in the course is *fairness*. If I do a special favor for one student, I will do it for all students. If I can't do it for all students, I won't do it for one.

I'm not doing too well in this course, so I want to take an incomplete now and finish the course next semester, OK?
No. The only circumstances that a grade of "incomplete" is assigned is for students who are passing the course but have a documented reason for missing the final such as serious illness, etc.

I'm not a whiner, but I study more for this course than I have for any other course in my whole life and I'm still getting a B. What can I do to bring my grade up to an A?
This is a tough question, as the answer may lie in a number of different areas. First and foremost, you probably need to spend more time studying. Research shows that you initially make great gains in learning with very little studying, but then the gains become smaller and smaller per unit time as the work continues. In other words, you may need to study 10 hours a week outside of class to get a C, 50% more hours to get a B, and another 50% more hours to get an A. The C-to-B gap is smaller than the B-to-A gap. Have your workshop leader set you up with an A student, and talk with that person about their study behavior.

Someone told me to study smarter, not harder. How can I study smarter?
As Thomas Edison said, "Genius is one percent inspiration and ninety-nine percent perspiration." You can improve the most by studying harder. Many people don't want to accept the fact that it takes work, sacrifice, and self-discipline to get good grades, so they look for some miracle system. However, many students can "study smarter" simply by scheduling 2 hours a day, everyday, alone and distraction-free, for this course.

How do I prepare for the exams?
Learn the fundamentals, and learn them well. In a classic psychology experiment, a bird was trained, in separate episodes, to do each of the following tasks: open a door in its cage, drag a box across its cage, stand on the box, and peck at a target. When the target was hung from the top of the cage and the box was placed behind the closed door, the bird figured out all by itself how to open the door, drag the box across the cage, stand on the box, and peck the target. Hopefully you are a bit more intelligent than a birdbrain (ugh, bad pun) and can do the same with chemistry knowledge. Consider the opposite situation. If you don't know the fundamentals, you have no opportunity to assemble them to solve a problem. Always include a review of the laboratory and workshop in your exam preparation routine.

Even though I earned a D according to the number of points I have, I deserve a C because of the circumstances of my life. Will you reconsider my grade?
No. I understand that some of you have jobs and are single parents, etc., and I commend you for taking this course under those circumstances, but your grade in this class is based solely on your performance on the evaluative instruments.

Why don't you announce the class average for exams? I "heard" that the average was ____, and I'm below/at/above the average, so does that mean my grade is going to be poor/average/good?
The average score for the class on any quiz or exam has no bearing on any individual student's grade. If you earn 90% of the possible points or more, your grade is guaranteed to be an A– or A. If all students in the course earn 90% of the

possible points or more, all students will earn a grade of A– or A. If no student in the course earns 90% of the possible points or more, no student will earn a grade of A– or A. Focus on your performance, not the performance of others.

I need a grade of ___ to graduate/keep a scholarship/remain eligible, and I earned a final grade of ___. Can I do extra credit to change my grade?
No. Your grade in this class is based solely on your performance on the evaluative instruments. Work diligently *during* the semester to be sure that you earn the grade you need. Grades are not changed after the semester.

A BRIEF PRIMER ON *DELIBERATE PRACTICE*

by Geoffrey Colvin

The best people in any field are those who devote the most hours to what the researchers call "deliberate practice." It's activity that's explicitly intended to improve performance, that reaches for objectives just beyond one's level of competence, provides feedback on results and involves high levels of repetition.

For example: Simply hitting a bucket of balls is not deliberate practice, which is why most golfers don't get better. Hitting an eight-iron 300 times with a goal of leaving the ball within 20 feet of the pin 80 percent of the time, continually observing results and making appropriate adjustments, and doing that for hours every day—that's deliberate practice.

Consistency is crucial. As Ericsson notes, "Elite performers in many diverse domains have been found to practice, on the average, roughly the same amount every day, including weekends."

Evidence crosses a remarkable range of fields. In a study of 20-year-old violinists by Ericsson and colleagues, the best group (judged by conservatory teachers) averaged 10,000 hours of deliberate practice over their lives; the next-best averaged 7,500 hours; and the next, 5,000. It's the same story in surgery, insurance sales, and virtually every sport. More deliberate practice equals better performance. Tons of it equals great performance.

All this scholarly research is simply evidence for what great performers have been showing us for years. To take a handful of examples: Winston Churchill, one of the 20th century's greatest orators, practiced his speeches compulsively. Vladimir Horowitz supposedly said, "If I don't practice for a day, I know it. If I don't practice for two days, my wife knows it. If I don't practice for three days, the world knows it." He was certainly a demon practicer, but the same quote has been attributed to world-class musicians like Ignace Paderewski and Luciano Pavarotti.

Many great athletes are legendary for the brutal discipline of their practice routines. In basketball, Michael Jordan practiced intensely beyond the already punishing team practices. (Had Jordan possessed some mammoth natural gift specifically for basketball, it seems unlikely he'd have been cut from his high school team.)

For most people, work is hard enough without pushing even harder. Those extra steps are so difficult and painful they almost never get done. That's the way it must be. If great performance were easy, it wouldn't be rare. Which leads to possibly the deepest question about greatness. While experts understand an enormous amount about the behavior that produces great performance, they understand very little about where that behavior comes from.

The authors of one study conclude, "We still do not know which factors encourage individuals to engage in deliberate practice." Or as University of Michigan business school professor Noel Tichy puts it after 30 years of working with managers, "Some people are much more motivated than others, and that's the existential question I cannot answer—"why."

The critical reality is that we are not hostage to some naturally granted level of talent. We can make ourselves what we will. Strangely, that idea is not popular. People hate abandoning the notion that they would coast to fame and riches if they found their talent. But that view is tragically constraining, because when they hit life's inevitable bumps in the road, they conclude that they just aren't gifted and give up.

Maybe we can't expect most people to achieve greatness. It's just too demanding. But the striking, liberating news is that greatness isn't reserved for a preordained few. It is available to you and to everyone.

Success in Studying for UM CHMY 141-3

1. Briefly preview each lesson before coming to class. Focus on the general structure of the lesson and the key words and concepts so that you have a sense of the big picture for the lecture and you know the new words and phrases that are going to be used.
2. Attend lecture and complete each breakout during the designated times. During lecture, concentrate on the presentation and supplement the *Think Out Loud!* with your own notes. If you get stuck during a breakout, make a note of why you are stuck. As soon as possible after class, work on correcting any missing prerequisite knowledge or problem-solving skill by reviewing the pertinent lesson(s).
3. Complete the homework set—*all* of it—before the next class meeting. Make a reasonable attempt at the solutions before you look at the textbook solution, but don't spend hours on any single problem. Mark questions as "easy," "medium," and "challenging." Summarize the lesson on a 3×5 card.
4. Take the quiz at the beginning of lecture and demonstrate that you can do homework-like questions under exam-like conditions.
5. Assess the returned quizzes for anything that you may have misunderstood by comparing the work in your homework notebook, your work on the quiz, and the key (and/or the textbook solution to the problems from which the quiz questions were drawn). If your solution does not exactly match the solution in the key, figure out why, no matter whether or not the grader deducted points. Keep notes in your homework notebook describing how you are learning from the feedback loop.
6. Repeat for each lecture cycle. Stay caught up! Set a goal of working each and every day on the homework, even if you only have a half hour available on some days. Be sure that your study environment is conducive to high-quality study (e.g., put your phone away for at least 1-hr intervals).
7. Approximately a week before each midterm exam, begin to re-do the homework sets, starting with the problems marked as "challenging," and work down to less challenging problems as time permits. Be sure that you can do problems without the cue of knowing which lesson they came from. Some past successful students reviewed by copying the homework questions and cutting the copies into individual questions, and then putting the individual questions in a container and randomly drawing questions from the set of lessons being tested on the next midterm. Systematically review workshop questions and lab reports (or follow the instruction of your lab instructor or coordinator about preparing for the lab question[s]).
8. Assess the returned midterms in a manner similar to assessing the returned quizzes. Identify what you didn't learn and learn it via the feedback loop. Continually keep in mind that you prepare for the final by correcting errors as they occur during the semester.

Feedback Loop

Utilizing the feedback loop is probably the most important part of learning. The first thing you should do when you start studying after Quiz n is returned is go to your homework notebook and the Lesson n problem set and match the quiz questions to their corresponding homework questions and try to figure out why you didn't get each answer exactly correct. Ignore the grading and concentrate on achieving perfection. If your answer didn't exactly match the solution in the book, figure out why. Did you answer the question correctly as homework but not on the quiz? Did you answer incorrectly as homework and then repeated the same error on the quiz? Did you omit a key word, not know a conversion factor, neglect to think about sig figs? Etc. Keep notes in your homework notebook about what the feedback loop told you. This analysis will teach you what you need to work on as you go through the homework–quiz–diagnosis cycle. Seek to reduce the number of that type of mistake on the next quiz by learning from your mistakes so that you don't repeat them. Then after an exam, do the same analysis. Compare your exam performance with your quiz performance with your homework performance. Figure out where the breakdown is occurring, and take action to improve your learning process at the exact point at which it is not working.

Metacognition

Metacognition is thinking about your thinking. This is particularly important when you are doing the Active Learning Exercises and homework questions. After you do each question, check your answer against the key, and diagnose if you have learned to solve that type of problem or demonstrate understanding of that concept, think about the point of assigning that question in a broad, general sense. Always be thinking about the fact that the homework is not a process of getting the "right answer" and then moving to the next question. The homework is there to help you learn the chemical principles and the problem-solving techniques. So always ask yourself, "What was that problem meant to teach?" and "Did I learn that principle or problem-solving approach?" before moving to the next problem.

What *Not* To Do

Do *not* mindlessly do the homework over and over again for hours with the hope that the concepts will magically stick in your mind. Study to achieve comprehension, not memorization. You must have a conscious plan focused on improvement. If you need new problems to practice with, use one of the sources in the Recommended list above.

POINT-BY-POINT COMPARISON BETWEEN HIGH SCHOOL AND COLLEGE *by Pat Feldman and Vicki Hill of Southern Methodist University's Altschuler Learning Enhancement Center*	
PERSONAL FREEDOM IN HIGH SCHOOL VS. PERSONAL FREEDOM IN COLLEGE	
High school is mandatory and free (unless you choose other options).	College is voluntary and expensive.
Your time is usually structured by others.	You manage your own time.
You need permission to participate in extracurricular activities.	You must decide whether to participate in extracurricular activities. (Hint: Choose wisely in the first semester and then add later.)
You need money for special purchases or events.	You need money to meet basic necessities.
You can count on parents and teachers to remind you of your responsibilities and to guide you in setting priorities.	Guiding principle: You're old enough to take responsibility for what you do and don't do, as well as for the consequences of your decisions.
HIGH SCHOOL TEACHERS VS. COLLEGE PROFESSORS	
Teachers check your completed homework.	Professors may not always check completed homework, but they will assume you can perform the same tasks on tests.
Teachers remind you of your incomplete work.	Professors may not remind you of incomplete work.
Teachers approach you if they believe you need assistance.	Professors are usually open and helpful, but most expect you to initiate contact if you need assistance.
Teachers are often available for conversation before, during, or after class.	Professors expect and want you to attend their scheduled office hours.
Teachers have been trained in teaching methods to assist in imparting knowledge to students.	Professors have been trained as experts in their particular areas of research.
Teachers present material to help you understand the material in the textbook.	Professors may not follow the textbook. Instead, to amplify the text, they may give illustrations, provide background information, or discuss research about the topic you are studying. Or, they may expect you to relate the classes to the textbook readings.
Teachers often write information on the board to be copied in your notes.	Professors may lecture nonstop, expecting you to identify the important points in your notes. When professors write on the board, it may be to amplify the lecture, not to summarize it. Good notes are a must.
Teachers impart knowledge and facts, sometimes drawing direct connections and leading you through the thinking process.	Professors expect you to think about and synthesize seemingly unrelated topics.
Teachers often take time to remind you of assignments and due dates.	Professors expect you to read, save, and consult the course syllabus (outline); the syllabus spells out exactly what is expected of you, when it is due, and how you will be graded.
TESTS IN HIGH SCHOOL VS. TESTS IN COLLEGE	
Testing is frequent and covers small amounts of material.	Testing is usually infrequent and may be cumulative, covering large amounts of material. You, not the professor, need to organize the material to prepare for the test. A particular course may have only 2 or 3 tests in a semester.
Makeup tests are often available.	Makeup tests are seldom an option; if they are, you need to request them.
Teachers frequently rearrange test dates to avoid conflict with school events.	Professors in different courses usually schedule tests without regard to the demands of other courses or outside activities.
Teachers frequently conduct review sessions, pointing out the most important concepts.	Professors rarely offer review sessions, and when they do, they expect you to be an active participant, one who comes prepared with questions.
Mastery is usually seen as the ability to reproduce what you were taught in the form in which it was presented to you, or to solve the kinds of problems you were shown how to solve.	Mastery is often seen as the ability to apply what you've learned to new situations or to solve new kinds of problems.
GRADES IN HIGH SCHOOL VS. GRADES IN COLLEGE	
Grades are given for most assigned work.	Grades may not be provided for all assigned work.
Consistently good homework grades may help raise your overall grade when test grades are low.	Grades on tests and major papers usually provide most of the course grade.
Initial test grades, especially when they are low, may not have an adverse effect on your final grade.	Watch out for your first tests. These are usually "wake-up calls" to let you know what is expected—but they also may account for a substantial part of your course grade. You may be shocked when you get your grades.
You may graduate as long as you have passed all required courses with a grade of D or higher.	You may graduate only if your average in classes meets the departmental standard--typically a 2.0 or C.
Guiding principle: "Effort counts." Courses are usually structured to reward a "good-faith effort."	Guiding principle: "Results count." Though "good-faith effort" is important in regard to the professor's willingness to help you achieve good results, it will not substitute for results in the grading process.

UM CHEMISTRY 141 AUTUMN 2016 GRADE SUMMARY

Name: _____ ID: _____

Section: _____ Workshop Leader: _____ Lab Instructor: _____

Exam 1	Exam 2	Exam 3	Exam 4		Exams Total 400 Possible
Quiz 1	Quiz 2	Quiz 3	Quiz 4	Quiz 5	
Quiz 6	Quiz 7	Quiz 8	Quiz 9	Quiz 10	
Quiz 11	Quiz 12	Quiz 13	Quiz 14	Quiz 15	
Quiz 16	Quiz 17	Quiz 18	Quiz 19	Quiz 20	
Quiz 21	Quiz 22	Quiz 23	Quiz 24	Quiz 25	
Quiz 26	Quiz 27	Quiz 28	Quiz 29	Quiz 30	
Quiz 31	Quiz 33	Quiz 34	Quiz 36	Quiz 37	
Quiz 38	Quiz 39				Quiz Total 140 Possible
Workshop 1	Workshop 2	Workshop 3	Workshop 4	Workshop 5	
Workshop 6	Workshop 7	Workshop 8	Workshop 9	Workshop 10	
Workshop 11	Workshop 12	Workshop 13	Workshop 14		Wksp Total 20 Possible

Laboratory Raw Total: _____ × (140/Raw Total) = _____
Lab Total
140 Possible

Final Exam Scaled Score: _____ × 3 = _____
Final Exam
300 Possible

Course Grade: _____
Course Total
1000 Possible