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CHEM 161.00: General Chemistry I

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**CHEMISTRY 161 GENERAL CHEMISTRY I
AUTUMN 2000**

- Instructor: Prof. Mark S. Cracolice, CP 101A, markc@selway.umd.edu.
- Office Hours: MWF 8:15–9:00 AM and by appointment. The purpose of office hours is to provide help in learning chemistry to individuals or small groups. Please submit other items such as drop requests, regrading requests, etc. in writing to my mailbox (CP 101) so that I can reserve office hours for those who need help.
- Prerequisite: The ability to use algebra to solve “word problems” and analyze laboratory data. Whether or not you have 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 Chem 161 until you get up to speed. You should have been placed in Math 117 or 121 or higher on the math placement exam to satisfy the math prerequisite for this course. Additionally, if it has been some time since you took high school chemistry, 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 Chem 104 before you take Chem 161 (see discussion of Chem 104 below).
- Course Purpose: A rigorous introductory survey of chemistry. 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 medicine, health, 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 Chem 161 generally have majors which require two years or more of chemistry. Chem 221–222 is a two-semester sequence in organic chemistry which is typically taken after Chem 161–162, and thus concepts from organic chemistry are only touched upon lightly in the course.
- Required: Cracolice, M.S., & Peters, E.I. (2000). *General Chemistry FLEXTEXT*. Harcourt Brace.
The course textbook.
- Cracolice, M. S. (2000). *Think Out Loud! An Active Learning Workbook to Supplement General Chemistry FlexText*. Harcourt Brace.
The lecture workbook.
- Gosser, D.K., Strozak, V.S., & Cracolice, M.S. (2001). *Peer-Led Team Learning General Chemistry*. Prentice Hall.
Written materials that serve as the foundation for the workshops.
- 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 in this course.
- The Prentice Hall Molecular Model Set for General and Organic Chemistry*. Prentice Hall, 1998. 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 the model set. It will not be needed until late in the semester and for Experiment H, 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.
- Optional: 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.
- 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.
- 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.

Any of the top selling general chemistry textbooks such as: Kotz & Treichel (Saunders), Brown, LeMay, & Bursten (Prentice Hall), Ebbing (Houghton Mifflin), Chang (McGraw-Hill), or Zumdahl (Heath).

Format:	The course consists of three components: lecture, laboratory, and workshop.			
Lecture:	MWF 2:10 PM–3:00 PM, ULH 101. Each lecture begins with a ten-minute quiz based on the lecture immediately prior. The remainder of the period is used to introduce new material, generally using <i>Think Out Loud!</i> and working with your workshop leader.			
Laboratory:	Sections 1 & 2	W	8:10 AM – 11:00 AM	CP 402
	Sections 3 & 4	W	11:10 AM – 2:00 PM	CP 402
	Sections 5 & 6	W	3:10 PM – 6:00 PM	CP 402
	Sections 7 & 8	F	8:10 AM – 11:00 AM	CP 402
	Sections 9 & 10	F	11:10 AM – 2:00 PM	CP 402

Details about the laboratory are covered in a separate syllabus. Prof. Valencich is the laboratory coordinator.

Workshop:	Section 1	F	8:10 AM – 10:00 AM	JRH 203
	Section 2	T	2:10 PM – 4:00 PM	LA 342
	Section 3	F	11:10 AM – 1:00 PM	FA 302
	Section 4	T	2:10 PM – 4:00 PM	JRH 204
	Section 5	T	2:10 PM – 4:00 PM	GBB 108
	Section 6	T	2:10 PM – 4:00 PM	SC 423
	Section 7	W	8:10 AM – 10:00 AM	JRH 203
	Section 8	R	2:10 PM – 4:00 PM	GBB 108
	Section 9	W	11:10 AM – 1:00 PM	FA 302
	Section 10	R	2:10 PM – 4:00 PM	JRH 204

Sections in italics meet in different rooms than what is posted in the class schedule. Workshop Chemistry is a peer-led team learning method of instruction. It is designed to actively engage you in the process of learning chemistry and improve your understanding of science in general, as well as develop your communication skills and cooperative attitudes.

Evaluation:	Evaluation for the purpose of establishing a course grade is based on:		
	1) Midterm Examinations	40%	
	2) Final Examination	30%	
	3) Laboratory	14%	
	4) Quizzes	14%	
	5) Workshop	2%	
Midterms:	Four midterm exams are given on the Thursday evenings specified in the calendar, 5:10 PM – 6:55 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 older material, laboratory, and 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. No other exam times are scheduled.		
Final Exam:	The final examination is given on the date and time specified by the registrar, Wednesday 20 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. 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 are multiplied by $[140/(\text{total lab points})]$ in the calculation of your final grade. The details of laboratory grading are outlined in a separate document.		
Quizzes:	Each lesson in <i>General Chemistry FLEXTTEXT</i> is comprised of a set of learning objectives and is followed by questions. These items should be the focus of your study. At the beginning of each lecture, a ten-minute quiz will be administered with questions drawn		

from the objectives 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 learning objectives. Each quiz is graded on a five-point scale. The best 28 of 36 quizzes are used in the calculation of your final grade, for a total of 140 points.

Workshop: Each workshop is graded based on preparation, attendance, and participation. You will receive 2 points for completing the self-test, attending and participating, 1 point for completing the self-test but not making any significant contribution, and no points if you do not complete the self-test and/or do not attend. The best 10 workshop grades are used in the calculation of your final grade, for a total of 20 points.

Note: The laboratory, homework, and workshop actually count for much more than the 30% than 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.

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 will 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	90%	900-1000 points	
B	80%	800-899 points	
C	70%	700-799 points	
D	60%	600-699 points	(D required for P for those using P/NP option)
F	< 60%	0-599 points	

Make-ups: 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. But what about students who miss exams for legitimate emergencies or illnesses? To account for this, we will allow you to replace one missing midterm score with your final exam score. But what if you are feeling ill, but decide to make an attempt to take the exam in spite of your illness and do poorly? Should you be punished for trying to take the exam? Obviously, we should not restrict our make-up policy only to students who miss an exam. Therefore, if you take all four midterm

exams, we will replace your lowest score with your score on the final exam, if the final exam score is higher.

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.

Eight of the 36 quizzes and three of the 13 workshops are not used in the calculation of your course grade to account for special circumstances such as emergencies and illnesses.

Grading: Midterm exams are graded on a 100-point scale by a process I call "modified multiple choice." The philosophy here 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 clearly and correctly shown, correct answer and sig figs
6-7 points	Correct setup, but sig fig and/or calculational error(s)
4 points	One significant error in the calculational setup such as an incorrect or missing conversion factor
2 points	Two errors in the calculational setup
0 points	Three or more errors; answer (correct or not) with no supporting work

Not all questions will fit this pattern. Nonetheless, you hopefully can understand the general philosophy from this example. 75% 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. 25% of the credit is awarded to answers that have two errors in the solution. No credit is given for answers with no work, a difficult-to-follow solution, or those with three or more errors.

Errors include "dumb mistakes" as well as not-dumb mistakes, whatever those are. We treat missing a $10 \text{ mm} = 1 \text{ cm}$ conversion factor equally with missing a $1.660566 \times 10^{-24} \text{ g} = 9.31502 \times 10^8 \text{ eV}$ conversion factor. Learn the fundamentals well!

Grade Errors: When midterm exams are returned, please check your exam for grading errors promptly. The answer key is posted the day following the exam on the first floor of the CP building. Barring emergencies, exams are returned by the Monday following the exam. If you believe that a grading error has occurred:
(a) write a brief note explaining the nature of the suspected error, and
(b) attached the note to your unaltered exam and place them in my mailbox before Friday.

Please do not submit your exam for regrading unless you are highly confident that a grading error occurred. If I believe that a grader has been too generous, I will lower your grade. I will also spot check grading on other questions on resubmitted exams. Reevaluated exams are returned on the Monday following the Friday resubmission deadline.

Perspective: Nationally, about half of the students enrolled in first-semester general chemistry for the first time drop or fail the course. If you consider both your probable lack of college-level study skills and the difficulty level of the course material, you will most likely find this to be the most challenging course you will experience. 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. So how do you become one of the half that passes? 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 you spend 8 hours per week in class, as a minimum, you should schedule 16 hours per week of study time. If you wish to earn an A or a B in this course, you should schedule 20-25 hours per week or more outside of class. The exact number of hours largely depends on your previous preparation and innate intelligence; 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 four hours each day, everyday, rather than cramming all 24 hours into a couple of days.

GRADE SUMMARY

Name: _____ ID: _____

Section: _____ Lab Instructor/Workshop Leader: _____

E1	E2	E3	E4		
					Exam Total 400 possible
Q01	Q02	Q03	Q04	Q05	
Q06	Q07	Q08	Q09	Q10	
Q11	Q12	Q13	Q14	Q22	
Q23	Q24	Q25	Q19	Q20	
Q21	Q27	Q28	Q29	Q30	
Q31	Q32	Q33	Q34	Q35	
Q15	Q16	Q17	Q18	Q37	
Q38					Quiz Total 140 possible
W01	WA/B	W2	WNom	W03	
W04	W06	W07	W08	W09	
W10	W11	W05			Workshop total 20 possible

Laboratory raw total: _____ × (140/raw total) =

Laboratory Total
140 possible

Final exam percentage: _____ × 3 =
(Replace lowest midterm score with final percentage if applicable)

Final
300 possible

Course Grade: _____ **TOTAL (1000 possible)**

Chem 104: Although not a required prerequisite for the course, Chem 104 is specifically designed to prepare students for Chem 161. If you did not pass the placement exam, you should start in Chem 104. If you marginally passed the placement exam, you probably should start in Chem 104. Chem 161 is offered in the Spring Semester, and Chem 162 is offered in the Summer Semester, putting you back on track for Chem 221 in the subsequent Autumn Semester.

- Chem 195: This option is no longer offered.
- Drops: **Monday 25 September is the last day to drop by Cyberbear or Dial Bear. Monday 16 October is the last day to drop with the signatures of your advisor and myself.** After 16 October, you have 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. This includes accident, illness, family emergency, etc. If this is the case, submit your completed drop petition *and a copy of the documentation* to my mailbox, and I will return the forms to the unclaimed exam area by the next day. 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 points to date, you will be assigned a WP grade.
- Why?: The specific objectives of the course are given in the textbook, but it is also important to address the more general course objectives. These can be summarized in one phrase: to introduce you to the way chemists study the universe. All health science curricula require, to some degree, an understanding of chemistry, and this is because the line 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.
- Other: Any student in this course who has a disability that may prevent him or her from fully demonstrating his or her abilities should contact me personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate your educational opportunities.
- Legal Notice: 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.
- FAQ: 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.
- I failed the first two exams, and now the drop date has past. Can I petition to drop because of my failing grade?
Sure, you can petition, but I will recommend that you *not* be allowed to drop. Make your drop decision by the drop date, 16 October.
- I failed the first exam. Should I drop the course?
The best predictor of your grade in this course is your grade on the first exam. For example, *all* of the students who scored less than 50% on the first exam in Autumn 1996 failed the course. It doesn't get any easier than the first exam, and subsequent material depends on understanding the material on the first exam. 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. It's your decision.

But I'm a special case because I'm _____. I need to take the exam on _____. I can't write a separate make-up exam for each student with special circumstances. It takes me one whole 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 can not 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 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 15 hours a week outside of class to get a C, 20 hours to get a B, but 30 hours to get an A. The C-to-B gap is smaller than the B-to-A gap.

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 3 hours a day, everyday, alone and distraction-free, for this course. This means that you need to get out of the UC, turn off the music, say goodbye to your friends, stop thinking about everything else, and enter the world of atoms and molecules while in your cubicle in the library.

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 (bad pun, I know!) and can do the same with chemistry knowledge.

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 solely based on your performance on the evaluative instruments.

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.