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**Web:** seaver-faculty.pepperdine.edu/dgreen  
**Lecture:** MTTh 10-10:50 a.m.; KSC 130

**Text:** Petrucci and Harwood, *General Chemistry*, 11th Ed. (You can actually use the 10<sup>th</sup> edition, but the homework assignments come from the 11<sup>th</sup> edition.)

**Lab:** Green, Ganske, Fritsch, *Experiments and Investigations in General Chemistry*.  
Jones & Bartlett, *The Official Laboratory Notebook*  
Lab coat, and safety goggles before your first lab.

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#### At-a-Glance Information

##### OFFICE HOURS

Tuesday	11a-12p
Wednesday	2p-3p
Friday	9:30a-10:30a
Email: All day until 10:00pm	

##### TENTATIVE EXAM SCHEDULE

Test 1	Thu, Sep 19	Chap 1-3
Test 2	Thu, Oct 17	Chap 4,5
Test 3	Thu, Nov 14	Chap 6,7
Test 4	Thu, Dec 5	Chap 8,9
Final	Tue, Dec 10	Final Exam 7:30 -10:00 a.m.

*Curiosity has its own reason for existing. One cannot help but be in awe when he contemplates the mysteries of eternity, of life, of the marvelous structure of reality. It is enough if one tries merely to comprehend a little of this mystery every day. Never lose a holy curiosity.*

- Albert Einstein

#### LEARNING OUTCOMES

The specific *Learning Outcome* aligned to the Chemistry Program Learning Outcomes is that at the end of this course students will be able to successfully solve a wide variety of multi-step problems using mathematical and descriptive algorithms that describe the behavior of atoms and molecules.

## GOALS and OBJECTIVES

The overall goal of this course is to provide students with an understanding of some of the principles, laws, and theories of chemistry such that they may continue on to higher levels of chemistry and other scientific fields in which chemical principles are exploited. Each student should gain competence in solving chemical problems of varying difficulty utilizing problem solving strategies such as dimensional analysis, application of standard formulae, and synthesis of new formulae and algorithms from prior knowledge obtained in this and other courses.

While the major foci are on the basic principles of chemistry and the analytical methods necessary to explore these principles, the specific goals are that every participant will...

- ✓ recognize that chemistry is an experimental science and, as such, cannot be completely mastered without also experiencing personally the “hands-on” aspects of science.
- ✓ recognize and appreciate that there may be multiple approaches to the solution of a problem and that there may be a “best” approach which is different from that learned in the past.
- ✓ understand that success in this course depends, in part, upon a working knowledge of the mathematics of chemistry as well as the chemical concepts underpinning the problem at hand.
- ✓ understand that success in this course also depends, in part, upon the dedication and commitment of the participant to study beyond that presented in lecture.

This course is nearly entirely introductions to and applications of topics from a largely limited body of chemistry. Because of this characteristic, **students must come to the lecture prepared with the foundational knowledge expected to have been obtained by reading the textbook chapter in advance.** Likewise, **knowledge and experience gained in the laboratory can not be extricated from the material presented in lecture.** Theoretical and practical topics will also be discussed which will expand on areas introduced in General Chemistry lecture, lab, and textbook. While coursework beyond the lecture is not required to succeed in this course, it is essential for mastery that participants not be intimidated from pursuing background or ancillary information necessary to fully understand a topic. **Reasonable mastery and recall of material from this semester of this sequence course is crucial to success in the entire course.**

Upon successful completion of this course every course participant should be able to:

- ✓ demonstrate the skills necessary to carefully and accurately solve chemical problems, including but not limited to: unit conversions, stoichiometry, gas laws, thermochemistry, chemical reactions, quantum mechanics, and chemical periodicity.
- ✓ show mastery of material by confidently demonstrating a solution to a colleague.
- ✓ recognize, in a list of data given for a problem, information which is required for obtaining a solution to a problem and that which is superfluous.
- ✓ understand qualitatively the microscopic nature of chemical reactions and other chemical principles.
- ✓ solve a variety of problems dealing with physical and chemical properties of substances, stoichiometry, chemical reactions, gas laws, energy transfer in chemical reactions, chemical analysis, basic quantum mechanics and electromagnetic radiation, and periodic properties and trends.
- ✓ write in scientific format reports of the theory, experimental method, and results of an analysis.

## RELATIONSHIP TO THE SEAVER COLLEGE MISSION

From The Mission of Seaver College of Pepperdine University: “*Seaver College exists to provide a link between the knowledge and wisdom of the past and present with the challenges of the future. The college is essentially a community...[of] teachers committed to a life of instruction and scholarship [and] students preparing to assume responsible roles in contemporary society....*”

This course is designed to provide the framework on which hangs a significant portion of the body of basic chemistry knowledge, allowing the perceptive participant to glance into the richness of the microscopic world from a macroscopic point of view, and to provide the foundation for further studies in the sciences. Over the course of the semester, the successful participant will develop new and expand upon existing skills in critical thinking, mathematics, and the scientific method. Since chemistry is by its very nature an experimental science, honesty and integrity in the acquisition and analysis of data is at the very core of the scientific process. It is part of our role as practicing scientists to defend the nature of scientific discourse and to expose pseudoscience and scientific dishonesty.

**ATTENDANCE** Generally, roll will not be taken. However, since the content of exams and homework problems is often covered in lecture, missing class is not advised. Chronic absences and/or leaving during class may result in a grade penalty. Tardiness is disruptive – please try to be to class on time. If you *must* leave early, advise Dr. Green before class starts.

**HOMEWORK** Homework will be assigned as we go. Homework is due on the assigned date at the assigned time. **Late homework will not be accepted – please don’t ask.** You must keep up with the reading and homework. Getting behind usually results in intense frustration later. This instructor has found that reading the chapters a minimum of at least twice – once quickly, once in depth – is necessary for approaching an average understanding of the material. Sufficient homework is assigned to give a representative overview of the chapter. Some homework may be assigned which has not been covered in lecture. This is because the instructor believes you are in college to learn as much as possible -- not only material for the tests (see also **A Note On Grades**). *You should work as many of the chapter problems as possible beyond those assigned* to achieve the best results in mastering the material, developing intuition and creativity, and personal accomplishment. DO NOT try to do the problems until you have read the chapter at least once completely.

Some students have grown accustomed to simply copying someone else’s homework in the last moments before it is due – this is unacceptable, has regularly been observed by this instructor, and can result in the posting of zero for that assignment (see also **PLAGIARISM AND CHEATING**, below).

***We are what we consistently do; excellence...  
therefore, it is not an act but a habit.***

**- Aristotle**

**EXAMINATIONS** Four tests will be given. So that one bad day on an exam will not ruin your course grade, your lowest test grade will count only one-half normal credit. If you score below 60% on two exams, please contact the professor concerning your status in the course. There is no mechanism built into the class to make up a missed exam. Make arrangements early if you will be missing an exam because you are a participant in a school sponsored event. In the event of an illness – with documentation from a physician or the University Health Center – contact the professor as soon as is practical to make appropriate arrangements.

**QUIZZES** Occasional unannounced short quizzes will be given during the semester so that you can track your progress and improve on deficiencies, if necessary. If you miss a quiz for any reason, it cannot be made up.

**DEADLINES** Homework and assignment due-dates are not negotiable. It is the responsibility of every student to meet due date deadlines. Quizzes and exams must be turned in when called for. Competency, mastery and success in any course (or career choice) is defined not only by the correct answer but by a person’s alacrity, facility, and finesse at completing timed tasks.

**OFFICE HOURS** Office hours are posted. The instructor obviously prefers you to come to posted office hours, **but if you cannot make it please make an appointment or even try just dropping by.** Appointments are made for many time slots. Those who avail themselves of in and out of office help usually do better in the course. If you are doing unassigned problems to gain proficiency, you professor will gladly go over the problem with you if you wish. **You may use and are encouraged to use e-mail to get non-immediate help as well.** The professor's e-mail address is given above.

**CURVING** You may be accustomed to being "graded on a curve." What is usually assumed by this is that if an average test score is not at an arbitrarily determined level, the teacher will adjust the scores or grade range-breaks so that the average does meet this numerical criterion. It makes little statistical sense (on which a *curve* depends) to curve a class of less than 50 students. A curve also tends to promote unhealthy competition which interferes with an atmosphere of cooperativity and friendly competition. In addition, if a class accepts that it will be graded on an adjustable curve, it must also accept that the curve may actually lower grades as well as raise grades.

In this course your grade will be based on your final course average and determined by a fixed scale:

Course Average	Grade
100-94%	A
90-93%	A-
87-89%	B+
84-86%	B
80-83%	B-
77-79%	C+
74-76%	C
70-73%	C-
etc.	

Scores on the borderline will be handled individually. *Borderline* is defined as being 0.51 percentage points from the next highest grade break.

**GRADING** It is important to remember that **grades are not wages.** You will not be graded on how hard you work – you will be graded on mastery of the assigned material. Your course grade is broken down as follows:

3 tests @ 100 pts	=	300 pts (54.9%)
1 test counted half	=	50 (9.1%)
Final exam @ 125 pts	=	125 (23%)
Homework and Quizzes	=	50 (9%)
Discretionary	=	18 (4%)
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Total	=	543 pts(100%)

As a member of a larger community of scholars and an elite academic environment, you have a number of responsibilities to others in this class. These points correspond to your conduct as a "good citizen" in the class. Actions that disrupt the learning environment or result in poor interactions with others or your instructor will adversely affect your grade. These include, but are not limited to, ringing phones or text chimes, arriving to class late, leaving during the middle of class, interacting through social media during class, etc. Chronic disruptions are noted and result in the reduction of the discretionary score.

**A Word On DEAD WEEK** Contrary to common belief, the last week of classes is not reserved for review, partying, etc. There will be lecture on new material and homework will be due. There might be some final exam review during that week also. An exam is scheduled for the final week of class, as well.

*To the scientist, the universe is a toy box full new toys and gadgets to played with and disassembled just to see how they work.*

- anonymous

## **A Word On Sorority, Fraternity, Sports, etc.**

Extracurricular activities such as debate, volunteering, community service, sororities, fraternities, athletics, drama and other artistic endeavors, etc. are important parts of your total education at Pepperdine. However, these activities require a very significant time commitment. **It is your responsibility to keep up in class while involved in extracurricular activities.**

## **PLAGIARISM and CHEATING**

Fortunately, in all likelihood, no one in this class will be subject this paragraph. Plagiarism and cheating are professionally and ethically wrong. Academic integrity is violated when one of the following events occurs: plagiarism, cheating, fabrication, or facilitating academic dishonesty. There exists a fundamental difference between working cooperatively (e.g. working together with friends or in a study group on homework problems which this instructor not only approves of but also recommends) and simply copying someone else's work. Academic and professional dishonesty are offenses of considerable magnitude. Careers have been brought to a close over a single incident. Students suspected of breaches of academic dishonesty will be referred to the University Academic Ethics Committee. *It's not worth it – trust me on this!* (See also <http://seaver.pepperdine.edu/academicintegrity/policies/violations.htm>)

## **CELLULAR TELEPHONES and SOCIAL MEDIA**

If you bring a cell phone with you to class, please turn it off or deactivate any audible signals before class starts – including the vibrate annunciator. It is very distracting (and stunningly inconsiderate) to have incoming calls during class time. The vibrate function is not silent – it sounds vaguely like a quiet cow – please turn it off. Some like to use their computer to take notes in class – a practice which your professor does not discourage. There is a strong temptation to engage in social media during class – a practice which your professor **strongly** discourages. ***Your course grade will be adversely affected if your phone audibly rings or if you are found to be using a computer for non-course-related activities during class.***

*One purpose of a liberal arts education is to make your head a more interesting place to live inside of for the rest of your life.*

- President McPherson, Bryn Mawr College

## **OTHER PET PEEVES**

There are really very few things that bother this professor during class time. An open and friendly classroom that allows for discussion and dialog is desired and, even, encouraged. However, there are a few behaviors that can elicit a strong and negative response. The chances of getting along with this and other professors are greatly increased if you avoid...

- ...chronically leaving and returning to the classroom during lectures.
- ...continued chatter past the scheduled start of class time.
- ...talking when the instructor is talking or another student is asking a question or speaking.
- ...habitually arriving late to class.
- ...making any noise while chewing gum.
- ...eating loud food or slurping through a straw during lectures.
- ...failing to laugh at your professor's jokes regardless of their humorous quality.

## **IMPORTANT INFORMATION THAT DOESN'T FIT ELSEWHERE**

The incomplete grade (I) will be assigned only in cases of an extreme emergencies and only in the last 3 weeks of class (after Exam 3 but prior to the final exam). According to university policies, the grade of incomplete will not be assigned to allow extra time for a student to improve their grade but, rather, only in the case where an emergency prevents a student from completing a course's culminating assignments and exams. Supporting documentation is

required. Should the need arise for non-emergency situations, there are 3 opportunities during the semester to withdraw from this course.

**There is no “extra credit” beyond that which is available to every student in class.** No exceptions; please, don't ask. Consider the rationale: If someone hasn't yet earned the available credit, how then can they be eligible for “extra credit”?

### **SAVING GRADED MATERIAL**

It is your responsibility to save all graded materials (exams, homework, etc.) for this class. As per university policies, all grade disputes must be settled by the midpoint of the next non-summer semester which immediately follows this course.

### **COUNSELING CENTER and DISABILITY SERVICES**

Students who feel that they may suffer from “test anxiety” or other academic obstacles despite exercising reasonable study and social habits may benefit by speaking to one of the staff in the Counseling Center.

Any student with a documented disability (physical, learning, or psychological) needing academic accommodations should contact the Disability Services Office (TCC264, x6500) as early in the semester as possible. All discussions will remain confidential. Visit [www.pepperdine.edu/disabilityservices/](http://www.pepperdine.edu/disabilityservices/) for additional information.

### **COURSE EVALUATIONS**

At the end of every course, each student has the opportunity to evaluate the course and the professor. This input is valuable for every faculty member so that they can discern both what is being well-presented as well as what may need to be modified to improve the course. Course evaluations are completed on-line near the end of the semester.

Your professor in this class appreciates your critique, both good and bad, and believes that you do not need to be motivated to complete your evaluation by receiving “extra credit” points or other tangible or intangible rewards.

### **LABORATORY**

The laboratory has an independent grade. You cannot rely on the laboratory to improve your lecture grade. Since the laboratory is often coupled to lecture, you will be responsible for some laboratory material in lecture.

### **SOME GENTLE ADVICE**

What and how you write in all media forms reflects on you and your professionalism. There exists different linguistic cultures in different “worlds”. Text messaging a friend on a cell phone or in internet messaging is a different world than emailing a professor requesting help and letters of recommendation or a prospective employer about a job. The rules of etiquette are different in different arenas. For example, “chatspeak” (when used correctly) is a fast and phonetic way to transfer information back and forth on a cell phone. Chatspeak, however, has no place in professional communication and simply appears as laziness. As a member of a community of professionals, let your communication style reflect on your professionalism. In professional communications, take the time to use good grammar and punctuation. Use proper honorifics and salutations. All of your faculty will appreciate it and will usually respond to you more quickly and respectfully.

### **INTELLECTUAL PROPERTY STATEMENT**

Course materials prepared by the instructor, together with the content of all lectures and review sessions presented by the instructor, are the property of the instructor. Video and audio recording of lectures and review sessions without the consent of the instructor is prohibited. Unless explicit permission is obtained from the instructor, recordings of lectures and review sessions may not be modified and must not be transferred or transmitted to any other person. Electronic devices other than calculators (e.g., laptops, cell phones, PDAs, calculators, and recording devices) are not to be used during lectures or exams without prior permission of the instructor.

### **PARTING NOTE**

If you are having any problems in the class, do not hesitate to come see me (this applies equally to out-of-class problems). No question is too dumb and I will attempt to accommodate the best I can if you need help outside of office hours.

## Some Important Dates

8/30/2017	Last day of add/drop period
9/2/2017	Labor Day holiday. <b>Laboratory is affected.</b>
9/9/2017	Last day to change CR/NC status
10/4/2017	Faculty Conference. <b>Laboratory is affected.</b>
10/21/2017	Last day to withdraw with a grade of W
<p>We will have had 2 exams by October 21. If you have not scored near or above 70% on these exams, this is a good chance to withdraw with no penalty to your gpa. If you are having problems in the course, please see Dr. Green before withdrawing from the course.</p>	
11/27/2017	Thanksgiving holiday. <b>Laboratory is affected.</b>
12/2/2017	Last day to withdraw with a grade of WP/WF
12/9/2017	Final exams

## A Note On Grades

Most students believe their course grade is important, and rightly so. However, many will try to "earn" an 'A' with a minimum amount of work, or with procrastination, cramming, etc., and perhaps even cheating. One goal of this instructor is to help you make the attainment of knowledge (not just chemistry) and its wise use your ambition. When you make learning *personal* and not simply a short-term goal to get you to the next class, job, etc. then the grade will have a new significance and be a by-product of (rather than) the goal. If you have recently graduated from high school, this "university" perspective of grades may be somewhat alien to your way of thinking. With this in mind, the guidelines for the definition of the course grade is outlined below. They will be the criteria used to determine your course grade.

**A** is the highest academic grade possible. This honor is **not** automatically given to a student who ranks highest in the course, but is reserved for accomplishment that is truly distinctive and demonstrably outstanding. It represents a superior mastery of course material and is a grade that demands a very high degree of understanding, originality, and/or creativity. Further, the student is characterized as one who takes initiative in seeking new knowledge outside the formal confines of the course.

**B** is a grade that denotes achievement considerably above acceptable standards. Good mastery of course material is evident and student performance demonstrates a high degree of originality, creativity, or both. Student works well independently and often shows initiative. Oral and written analysis, synthesis, and critical expression is considerably above average.

**C** indicates a satisfactory degree of attainment and is the acceptable standard for proceeding to more advanced work in the field. It is the grade that may be expected of a student of average ability who gives to the work a reasonable amount of time and effort. This grade implies familiarity with the content of the course and acceptable mastery of the material. Student displays some evidence of originality, creativity, or both. Student works independently at an acceptable level and **completes all requirements in the course**, including attendance and participation.

**D** denotes a limited understanding of the subject, meeting only the minimum requirements for passing the course. It signifies work which in quality and/or quantity falls below the average acceptable standard for the course. Performance is deficient in analysis, synthesis, and critical expression and lacks in originality and creativity. This grade is insufficient to proceed to higher level courses in the discipline. For most students this grade is the result of insufficient devotion of time to the course.

**F** indicates inadequate or unsatisfactory attainment and a serious deficiency in understanding of material. This grade also indicates the student cannot work independently and/or fails to complete assignments. This grade is usually earned by students who do not attend class or devote sufficient time to study. This grade, like the 'D', is inadequate for proceeding to higher level courses in the field.

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## Generally Observed Student Characteristics

(Adapted from John H. Williams, *The Teaching Professor*, 1993, pp 1-2)

### The "A" Students...

<b>Attendance</b>	...have nearly perfect attendance.
<b>Preparation</b>	...are prepared for class. Their attention to detail is superb and they usually read the material prior to class.
<b>Curiosity</b>	...show a high level of interest in the subject matter whether they actually like the subject or not. They look up or search out answers to topics that they don't understand. They often ask interesting questions or make insightful comments.
<b>Retention</b>	...are able to retain new material and consciously connect past learning to the present.
<b>Attitude</b>	...have an attitude that displays both the determination and self-discipline required for success. They also show initiative and do things without being told.
<b>Talent</b>	...possess a special talent. It may be exceptional intelligence and insight or it may be unusual creativity, organizational skills, commitment and perseverance - or a combination thereof. These gifts are evident to the professor and usually to the other students as well.
<b>Results</b>	...make the highest grades on tests and their work is generally a pleasure to grade.



### The "C" Students...

<b>Attendance</b>	...put other priorities ahead of academic work and may miss class frequently.
<b>Preparation</b>	...prepare their assignments consistently, but in a perfunctory manner. Their work may be sloppy or careless and at times is incomplete or late.
<b>Attitude</b>	...are not visibly committed to the class. They participate, if at all, without enthusiasm and their body language often expresses boredom.
<b>Talent</b>	...vary enormously in talent. Some have exceptional ability, but show undeniable signs of poor self-management or bad attitude. Other are committed and diligent, but are simply average in academic ability.
<b>Results</b>	...obtain mediocre or inconsistent results on tests. They have some concept of and familiarity with the material, but clearly do not show mastery of the subject matter while insisting otherwise.

## A Guide to Learning

The following taxonomy<sup>1</sup> summarizes the 6 levels of learning. Generally, it may be said that a student who wishes to master the material of a class will strive to reach level 6.

Notice that to move up in the learning hierarchy, a student will have, for example, mastered the language of the field and possess a knowledge-base of basic facts before they can select the correct formula to solve a problem given a list of data. A level 6 "thinker" will necessarily have mastered the lower levels to such an extent that they can call upon those tools as necessary to solve the problem at hand. It is suggested that one cannot effectively move to higher levels until lower levels have been adequately addressed.

- 1. Knowledge** Language of chemistry, nomenclature, facts, memorization
- 2. Comprehension** Qualitatively predict outcome of a reaction or process, summarize results, estimate a result
- 3. Application** Use formulas to solve a problem ( $d=m/v$ ,  $PV=nRT$ , etc.), apply and calculate, algebraic manipulation, explain and demonstrate
- 4. Analysis** Gather and use experimental data to solve an assigned problem, present results in written or oral format
- 5. Synthesis** Use prior knowledge to derive new knowledge, derive from known equations new and useful equations, utilize prior material learned in prior courses in current course, read the primary and secondary literature to obtain necessary tools for performing an experiment, independently design a new experiment or analysis, gather and use experimental data to solve a problem, write and speak clearly and accurately in the scientific style
- 6. Evaluation** Examine data and results to distinguish quality from "noise", read the primary literature and rationally and critically discuss the results presented, predict the outcome of similar experiments

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<sup>1</sup>This hierarchy is based on Bloom's Taxonomy of Cognitive Learning

## Frequently Asked Questions

### I haven't had high school chemistry. Am I at a disadvantage? Can I still get a good grade?

You are at very little disadvantage and, of course, you can get a good grade. General Chemistry is taught as if you have not had any background in chemistry. If you have had high school chemistry some of the material will be review. We have discovered that a good math background is more essential for success in General Chemistry. In any case, with diligent study almost everyone can succeed in this course (or in any course, for that matter).

### What is the key to success in General Chemistry?

Practice, practice, practice. This means putting in quality study time every day. Chemistry is like a foreign language or a musical instrument. **If you don't practice, don't expect to get really good at it.**

### How should I "practice" chemistry?

Every day, spend at least one and one-half to two hours (eek!) reading the chapter and taking notes, rewriting your lecture notes neatly and more completely, and **working as many problems as possible**. Even redoing problems you have already completed - even in prior chapters.

You might try alternating study activities day-to-day... one day read and take notes, rewrite lecture notes, and work example problems. The next day work end-of-chapter problems. The day after reread and work problems, etc. Take Saturday or Sunday off from chemistry if you have put in 2 or more quality hours per day during the week. **4 hours on Tuesday does not cover the 2 hours you didn't do on Monday!** The point is... KEEP UP with the material so you don't have to cram the couple of nights before the exam.

"Cramming" **does not work!** Trust me.

### It sounds like you want us all to be chemistry majors.

Not at all. This is the minimum amount of time you must put in. Chemistry majors will probably put in more (naturally). A good foundation in chemistry will serve you well in your other science courses (kind of like math).

### Do I have to take notes?

Consider the possibilities:

- You have a photographic memory and have total recall of anything you see; then there is no need to take notes.
- What the instructor does in class is done to dazzle and impress you and is not designed in any way to contribute to your understanding of the material; then, sit back, relax, be dazzled and impressed, but don't bother taking notes.
- The premises of 'a' and 'b' are false; then, take careful, detailed notes that allow you to reconstruct and study what has been covered in lecture.

### Do you collect homework?

Yes... but read on. The purpose of homework is to practice and master the course material. You would not expect to master tennis solely by watching someone else play without yourself practicing. The instructor of this course really does not need to see your practice work; however, to insure that you are indeed practicing, homework is assigned, collected, and graded. Be aware that homework may not be returned before an exam. Thus, it is important that you make a copy of your work or do extra problems and be sure that you are doing them correctly. Office hours are useful for checking your work on unassigned problems.

### "Is this going to be on the exam?"

Fortunately, I haven't heard this question in a long time, but let's understand the rules of the game anyway. It is the job of a course instructor to coerce you into studying all the material they think is important. This normally includes reading material, handouts, and lecture topics. It is the task of the course instructor to determine if you have learned the material. This is normally done by giving exams in which questions representative of the material are asked. There is insufficient time to ask every possible question. If you have learned the important material, you should be able to answer the representative questions. If I tell you in advance which questions are on the exam, it

- spoils the surprise (just like spoiling Christmas).
- tempts you to study only the material on the exam. (As hard as it is to believe, given the opportunity, some less motivated individuals will actually do this.)
- decreases the content of the course to only those topics tested.

**You said you don't really take roll. Does that mean attending lecture is optional?**

Yes, the lectures are optional. Graduation is also optional.

**I was not in class. Did you do anything important?**

Yes.

**OK, then it sounds like we are going to work hard.**

Yes. You may work harder in this course than you have worked in any other course. Maybe not. But I (we in the Natural Science Division) want you to extend yourself intellectually farther than you think you can. You are capable or you wouldn't be here.

**But I work to pay the school.**

I know. If you work or join a club or play a sport, you **must** organize your time to include study when you are awake, fresh, well-fed, sober, not high, undisturbed, unruffled, and, well... you-get-the-point. Every activity you do must be weighed against how it will affect your success in your coursework.

**Do you flunk anyone?**

I don't take credit for any good grades earned; I won't take credit for poor grades. See also the instructor's feeling on grades below.

**So... do... you... give... 'F's**

Yes.

**You're kidding about all this - I mean the "time" stuff, the "organization", "keeping up" and all that.**

No.

**No, really. This is just to scare us.**

No.

**But this doesn't give me time for my other classes.**

You will have plenty of time for your other classes... if you budget your time carefully.

**Why are you so unreasonable?**

Just am.

**What is your feeling on grades?**

Please don't fret and worry about your course grade - let me, I'm better at it. Please fret and worry (well, be concerned with) learning chemistry. If you learn the subject the grade will follow (sort of the *Field of Dreams* approach). Part of the grade is not only how well you learned a topic but also how fast you can use the information in a new setting (see **A Note on Grades**).

# General Chemistry 120

## Approximate Chapter Calendar

This calendar gives the approximate content coverage of each chapter. We will proceed at a brisk pace but may get ahead or behind at some point. **These are the concepts that you must master.** Refer to this occasionally to check on your progress.

Chapter	Content Coverage	
1	<b>Matter – Its Properties and Measurement</b> Definitions Properties The <i>Scientific Method</i> Atoms, Elements, Molecules, Compounds, Mixtures Measurements Significant Figures Dimensional Analysis Applications	
2	<b>Atomic Theory</b> Historic Perspectives Fundamental particles: electrons, protons, neutrons Experiments that showed the existence of the fundamental particles Isotopes, isotopic abundance, mass spectrometry Relative Atomic mass scale The Nuclear Atom Periodic Table I Atomic mass (atomic weight) The Mole	
3	<b>Chemical Compounds</b> Periodic Table II Atoms, molecules, formula units Chemical Formulas Formula mass (formula mass, molecular weight) Calculations based on chemical equations: molecules, moles, mass Simplest formula Percentage composition and chemical formulas Review of Nomenclature (from lab)	
<b>Exam 1 (1-3)</b>		
4	<b>Chemical Reactions I: Stoichiometry</b> Chemical equations Stoichiometry Limiting reagent Percentage yield Multistep reaction stoichiometry	
5	<b>Chemical Reactions II: Solution Chemistry</b> We will spend only a short amount of time here. This will be covered extensively in lab. You will be responsible for the material.  Types of reactions Applications: Volumetric and gravimetric analysis	
<b>Exam 2 (4,5)</b>		
6	<b>The Gaseous State</b> Properties Ideal Gas Laws Reactions and stoichiometry Mixtures and Dalton's laws KMT	

7	<b>Thermochemistry</b> Definitions First Law Enthalpy of reaction Measurement	
8	<b>Quantum Theory of the Atom</b> EM radiation Photoelectric effect (photons are particles) Electron diffraction (particles are waves) <b>Models of the Atom and Origin of the Models</b> Bohr model and line spectrum of hydrogen Quantum mechanical model Quantum numbers, atomic orbitals, e <sup>-</sup> configuration	
<b>Exam 3 (6,7)</b>		
9	<b>The Periodic Law and Atomic Properties</b> Periodic Table III Electron configuration Periodic properties: IE EA Paramagnetism and diamagnetism	
<b>Exam 4 (8,9)</b>		

### **Disclosure Statement Required by the State of California**

REGULATORY NOTICE: Natural Science Division laboratories contain, and certain class experiments or procedures will expose you, to chemicals known to the state of California to cause cancer, birth defects, and other reproductive harm at levels which require a warning. For more information, contact your instructor or the Office of Regulatory Affairs at extension 4702.

So... there.

## **About Math and Chemistry**

Adapted, in part, from *Eastern Michigan University Handbook for Undergraduate Chemistry Students*

Chemistry, and science in general, can be used for tremendous good – or evil – because it equips us to go beyond just *talking* about problems to working out actual solutions. There is even a language with its own specific vocabulary devoted to the chemical sciences. However, the moment you want to go beyond talk, some calculations are going to be necessary. How do we assess your math background then?

The Chemistry Department of Pepperdine University uses a simple, but effective, rubric to determine eligibility for General Chemistry. We start with your SAT or ACT math score. Students who have a borderline score are then assessed by their experience in mathematics beyond high school. Another effective, but only occasionally used, method is for the student to take yet another “math placement” exam.

Nonetheless, there is a saying that is more urgently true today than ever before:

### **MATH IS THE GATEKEEPER**

You don't need to like math. You don't even need to be particularly good at it. But, you must be able to do it (preferably, without letting it sense your fear). The math choices you make now, while you are in college, will set limits against which you will strain for the rest of your life.

You may have noticed that there was a strong math prerequisite to get into this course. This requirement is by design. Your chemistry faculty have been following the success and failure of General Chemistry students for many, many years both at Pepperdine University as well as other universities. The single most common factor that seems to determine the success of a student in college and university General Chemistry is not...

- ...their “great” high school chemistry course
- ...having had AP chemistry
- ...having already taken two other chemistry courses

No. The greatest single factor seems to be a strong background in mathematics. It is unclear why this is so but studies show that it is related to the logical reasoning skills required in mathematics that translate into the skills necessary to recognize and solve chemistry problems of all types (mathematical or not).

The second most important factor for determining success in General Chemistry (or, in fact, in any course) is one's attitude toward learning. If you don't like chemistry and can't get past a negative attitude that may instill, it will be very difficult to perform to your desired level.

If you are considering a career in any area of science or field that requires science coursework, start your math sequence as soon as possible, and go as far as possible – even more than is required, if possible. Calculus is the mathematical language of choice whenever people get serious about quantitatively describing how something depends on changes in something else. That includes business and the physical, biological, and social sciences. Barbie was right, “Math class is hard,” – but she still took it!<sup>2</sup>

### **YOUR CHOICE: HARDER COURSES AND MAYBE RISK YOUR GPA? OR EASIER COURSES AND MAYBE GET BETTER GRADES?**

This is a very individual decision, the answer to which depends on your personal standards and what stage of your life you are in. For some, Pepperdine is just a place to have some fun for a few years, while at least creating the illusion of getting an education. For them, the answer is a no-brainer (fortunately) – run quickly, steering clear of math, chemistry and, generally, science. For others, who are more mature and serious about how they spend their time and money (keeping in mind Pepperdine's tuition), here are some good things to consider while in General Chemistry:

- You will learn some *facts* about physical reality, explaining some things you've wondered about since you were a kid, and ensuring that you won't be technologically lost as you go through life in a modern, technological world.
- You will learn reasoning and problem-solving skills that are valuable in *every* walk of life. For example, one finance employer likes to hire scientists because, “[Scientists] are not afraid of data, not afraid of numbers and units, and...not afraid of hard work.” (*Chem. & Eng. News*, May 7, 1990, p 84.)
- As a scientist, you will develop and refine skills you can use to make the world a better place. And there is no doubt that you will be able to get a job related to your degree.
- You will never, ever find yourself sitting across from a job interviewer who is looking at your transcript and asking you to recite, “Do you want fries with that?”

## Tips to Better Scores on Homework, Quizzes, Exams, and Laboratory Reports

Excellence in presentation and attention to details are some evidences of mastery and comfort in a field of study. When working class and laboratory assignments, please attempt to conform to the following guidelines to receive the maximum possible credit:

- All work must be legible.
- All numerical values that are not pure counting numbers must have units (e.g., 1.23 m, 4.5 g)
- Do not improvise units. (e.g., 1.23 m is 1.23 meters. The 'm' means meters, not moles, molecules, miles, etc. Kilograms are kg, not Kg, kG, etc.)
- Avoid assigning units as variables. (e.g., the equation  $d = \frac{m}{V}$  should generally not be written with the units assigned as the variables:  $d = \frac{g}{mL}$ )
- A solution to a problem should be logically presented and algebraically consistent. For example, a two step problem might be presented as follows:

Calculate the mass, in milligrams, of 2.5 mL of water (density = 1.00 g/mL)

$$m = 2.5 \text{ mL} \times 1.00 \frac{\text{g}}{\text{mL}} = 2.5 \text{ g H}_2\text{O}$$

$$m = 2.5 \text{ g H}_2\text{O} \times \frac{1000 \text{ mg}}{\text{g}} = 2,500 \text{ mg H}_2\text{O}$$

or

$$m = 2.5 \text{ mL} \times 1.00 \frac{\text{g}}{\text{mL}} \times \frac{1000 \text{ mg}}{\text{g}} = 2,500 \text{ mg H}_2\text{O}$$

**but not**

$$m = 2.5 \text{ mL} \times 1.00 \frac{\text{g}}{\text{mL}} = 2.5 \text{ g H}_2\text{O} \times \frac{1000 \text{ mg}}{\text{g}} = 2,500 \text{ mg H}_2\text{O}$$

- Avoid round-off errors in intermediate calculations.
- Use a leading zero in fractional decimal figures less than 1. Often the decimal point is not seen by the grader (e.g., 0.123 g not .123 g)
- When graphing, use a graphing program or spreadsheet program for best presentation.
- Use the proper form in writing chemical symbols. (e.g., sodium is Na not NA; platinum is Pt not PT.)
- Write exponential notation correctly: 13240 m is  $1.324 \times 10^4$ , not 1.324E4 or (gasp!)  $1.324^4$ . Some instructors don't care: yours does.
- The names of chemical compounds are not proper nouns unless they are trade names. (e.g., sodium chloride, not Sodium Chloride; potassium sulfate, not Potassium Sulfate; etc.)

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<sup>2</sup> If you aren't sure of the origin of the Barbie/Math relationship, perform an internet search. In 1994, one of Teen Talk Barbie's recorded phrases was "Math class is tough!" The doll became the flashpoint in a national discussion on girls and education (and a not insignificant recall of the famous doll).

