

GENERAL CHEMISTRY (01:160:165) SOLID GEMS

GENERAL INFORMATION, FALL 2016

Welcome to Solid Gems Chemistry 165 (same as 161), the first semester of the "General Chemistry" course sequence. We sincerely hope that you will find this course to be a valuable part of your professional training, as well as an enjoyable experience. Your success in the course will also be our success - but we will have to do it together.

This handout provides information about the organization of Chemistry 165, the course policies and the procedures we will follow in testing and assigning grades. The course syllabus is provided separately.

Course Coordinator, Administrator and Lecturer:

Professor Asbed Vassilian

Lectures: MW 10:55-12:15 HCK 101 (DC) F 2:15-3:35 HCK 101 (DC)

(848) 445-5879 asbed@chem.rutgers.edu

Chemistry Room 126, Wright Rieman Labs, Busch Campus.

Required materials

- Text: "Chemistry: Structure and Properties" by Nivaldo J. Tro. The book includes the online registration for online homework and access to the e-book.
- Scientific calculator (logarithms, exponential, powers, roots, etc.). This does not have to be anything more powerful than a \$15.00 calculator

These items are available at the Rutgers University Bookstore (732-246-8448) or at NJ Books (732) 828-7401. The bookstore also sells scientific calculators.

In addition, you need a computer account and NetID. If you haven't already set one up, go to <http://www.nbcs.rutgers.edu/computersetup.php>

Learning Goals:

Understand and apply basic principles and concepts in chemistry as applied to scientific topics, specifically:

1. Atoms and periodic table
2. Quantum theory
3. Chemical bonding
4. Stoichiometry
5. Reactivity
6. Gases
7. Molecular Shapes
8. Chemical Reactions and Energy Changes

Intellectual Property

The material for this course is copyrighted and may not be posted on any other web site at or outside of Rutgers without permission. Any violation of this policy will be treated as an academic integrity violation and will be referred to the Office of Student Conduct or Equivalent for action.

Students with Disabilities

We attempt to accommodate students with disabilities in an appropriate manner. If you require extra time for assignments, you will need to get a letter from the Office of Disabilities Services (ph. 732 932-2848 or dsoffice@rci.rutgers.edu) confirming this. It is impossible for us to provide extra time for the quizzes, but an adjustment in your quiz scores will be made to account for this. We will attempt to schedule your exam to begin before the regular exams so that the ending time is the same as for other students. If your accommodation isn't approved in time for the first exam, you must present the appropriate documentation **no later than** 2 weeks before any subsequent exam. You only need to submit documentation once.

If you have a physical disability that requires assistance during the exam, you must let us know so that we can make the appropriate arrangements. If you require

additional support in recitations or in lecture, please make sure the administrator and the Office of Disabilities Services are aware of the circumstances.

Lectures

There will be three lectures per week, each 80 minutes in length, on Mondays, Wednesdays, and Fridays in HCK 101 on the Cook/Douglass Campus: MW:10:55-12:15 and F:2:15-3:35. You should attend all lectures for which you are scheduled. Most of the teaching in the course will be carried out in the lectures, where you will learn not only the chemistry, but where you will also receive guidance on how and what to study. Attendance is of utmost importance since the lecturers will be emphasizing and clarifying important and difficult concepts. Unless informed otherwise, you will, at exam time, be held responsible for having learned all the assigned readings whether or not they are explicitly discussed in class. Any changes in the course format and/or information about exams and quizzes will be announced in lectures. You will be held responsible for knowing the information and acting accordingly. Our experiences have clearly been that students who do not attend lectures regularly tend to do more poorly in the course than those who do attend on a regular basis.

Reading Material

The reading material listed in the syllabus is what will be covered in the next lecture. To get the most out of the lectures, you should read the appropriate sections the night before. The syllabus is an approximation. The actual pace of the class will have to be determined by the abilities of the class itself. Some days, we will be ahead of the syllabus; some days we may be behind.

Recitations

You are scheduled for two 55-minute recitations per week on Tuesdays and Thursdays. Memorize your recitation section number and your recitation instructor's name. Attendance in recitation is mandatory and will contribute 30 points to your grade. In particular, students whose grades are near borderlines may well have their assigned grade determined by their attendance in recitation. The purpose of the recitation section is to provide you with an opportunity to interact with a member of the instructional staff of the course in a relatively small group, to permit you to ask questions, and to provide additional instruction and drill on crucial topics. Please be prepared, and do not hesitate,

to ask questions in order to utilize recitation time effectively. The questions need not be restricted to suggested problems. Any material that is not clear from the textbook or the lectures should be discussed during recitations; problems can be discussed in detail during the recitations. Recitation is an integral part of the course and should be attended regularly. Your recitation is your direct link with the course. Your records are filed by recitation section and your recitation instructor is available to provide you with significant extra help and to help you with any problems you are having related to the course.

Classroom Management System

We will be using sakai (URL: <http://sakai.rutgers.edu/>) as a classroom management system. You should check this site regularly. If you check it now, you will find a number of documents posted. If you are registered and a Rutgers Student, you will automatically be a “member” of the online class. You will need your NetID to login. You should read these documents, especially the Syllabus and General Information very carefully. During the course many additional documents will be posted on the web site including lecture notes, practice exams, and useful information or explanations about important topics.

Chemistry 134/133

If your problem-solving and quantitative reasoning skills at the level of high school algebra are very weak, you may want to drop Chemistry 165 immediately and enroll in the one-semester, three-credit course “Introduction to Chemistry”, Chemistry 134. This is NOT a substitute for Chemistry 165. You may then take Chemistry 165 (equivalent to chemistry 161) next spring, summer, or fall. You should speak with Professor Vassilian before deciding to switch to Chemistry 134.

There is another alternative. If you discover after several weeks that, despite adequate study, you are not prepared for Chemistry 165, you may want to take the one-semester, two-credit course “Preparation for General Chemistry”, Chemistry 133. This starts in mid-October and is the same as Chemistry 134 from mid-October through December. You will not be at a disadvantage because you started this course in October, but you should continue with Chemistry 165 until Chemistry 133 begins. The special procedure and deadline for switching into Chemistry 133 will be

announced in October. (Chemistry 133 is not offered in the spring semester.)

Chemistry 171 LABORATORY

General Chemistry (160:165) is a lecture course, and is completely independent from Introduction to Experimentation (160:171), which is a one-semester, one-credit laboratory course. A student may take Chemistry 171 in either the fall or the spring semester (or possibly in the summer), if his or her major requires the course. Chemistry 171 begins with the first day of classes, and the first meeting is more than a check-in period. If you are taking Chemistry 171 this semester but your registration or section assignment is not yet official, be sure to attend any laboratory section during the first week of classes. Note that some sections may be full.

Examinations

There will be four 80 minute "hourly" examinations given during the regular lecture period. The dates, time, and the material to be covered on each exam is shown in the Syllabus (and summarized immediately after). Please read them carefully. Each 80 minute examination will account for 100 points. A final 3 hour examination covering the entire course material will be given during the final exam period on Friday, 16 December 2016 from 12:00-3:00 PM. The final exam will be worth 200 points. The locations for the hourly exams will be announced in class and will be administered on the dates given in the syllabus. (Different sections will take the exams at different locations). The location for the final exam will also be announced at a later date.

Hourly examinations will consist of multiple choice questions; the final exam will be cumulative and will also consist of multiple choice questions. The lecturer will indicate the extent to which necessary constants, the periodic table and formulas will be provided. Please come to the exam location 15 minutes before the starting time. Bring your university ID card for identification purposes, your scientific calculator and a #2 pencil. Every student must be able to provide identification in order to take an exam - a current photo ID is preferred. The sharing of calculators during exams is forbidden.

See your recitation instructor within three days if you miss an examination for verifiable medical grounds and provide him/her with a written explanation and supporting documents. In such cases the final exam may be weighted more heavily to

offset the missed exam. All examinations will contribute to the final course grade. Unexcused absence from an examination or a quiz will be counted as zero.

QUIZZES

There will be eight quizzes during recitations accounting for a total of 120 points towards the cumulative point score. All quizzes will emphasize the material as per the attached schedule. Sharing of calculators during quizzes is forbidden. If you miss or anticipate missing a recitation quiz for a legitimate reason (a reason acceptable to your recitation instructor), you must try to make up the quiz during another recitation section meeting that same day. If this is not at all possible, contact your recitation instructor for make-up or credit within three days of the missed quiz date. Please note that if you haven't spoken with your recitation instructor within three days of a missed quiz you may not receive any credit at all. All quizzes will be counted towards your grade. None will be dropped and an absence counts as zero. A make-up quiz grade will be credited towards your course grade only if pre-approval has been obtained from your recitation instructor. **DO NOT ASK THE LECTURER FOR PERMISSION TO MAKE UP A QUIZ!** The permission to make up quizzes is entirely at the discretion of the recitation instructors.

ONLINE HOMEWORK

There will be five online homework assignments. These are considered as reviews for your exams and the final. In order to get credit for these homework assignments, you should submit them within the assigned deadline. Late submission will **not** be accepted.

ATTENDANCE

Attendance will be taken during recitation and periodically during the lecture period. Attendance grade will be added to your total points. Please don't miss any lecture and/or attendance.

Course Grading

A tentative curve for grades will be made for each examination, but the course grade will be based on the total number of points a student accumulates. The maximum score is 800 points, distributed as follows:

Exam I	100 pts
Exam II	100 pts
Exam III	100 pts
Exam IV	100 pts
Quizzes	120 pts
Attendance	30 pts
OnlineHomework	50 pts
Final exam	200 pts
<u>Total</u>	<u>800 pts</u>

Note the importance of the final exam in determining your overall score and hence course grade. Also, if your final examination grade differs markedly from your hourly examination grades, the final will be weighted more heavily. In borderline situations, your quiz scores, class attendance, and class participation could either improve or lower your course grade.

Academic Integrity:

All University policies on academic integrity will be strictly enforced. Any involvement with cheating, the fabrication or invention of information used in an academic exercise, or facilitating academic dishonesty of others will result in serious consequences ranging from reprimand to expulsion. Bringing information into an exam, whether stored electronically or on paper, shall be considered cheating. Having a cell phone or pager at hand during a test shall be considered evidence of cheating. All electronic devices, other than a calculator must be turned off and out of sight during testing. Use of calculators with the ability to communicate with other calculators, calculators that are programmable or that have any permanent alphanumeric memories (“graphing” calculators) is expressly forbidden. A summary of Rutgers policy on Integrity can be found at: <http://ctaar.rutgers.edu/integrity/policy.html>.

Chain of Command

In general, routine questions regarding course material, homework problems, quizzes, exam scores, absences etc. should be directed first to your recitation instructor. Only for further information, or if the above procedure fails to resolve a particular problem, should you contact your course lecturer.

Additional Help

"General Chemistry" is considered by many students to be a moderately difficult course. When you look at the syllabus, you will probably conclude that there is a lot of work assigned, perhaps significantly more than is assigned in some of your other courses. Such a conclusion is correct - this course will most likely be considerably more demanding than many of your other courses. We expect that you will spend an average of at least 12 hours per week studying for this course. If you do your work in a timely and conscientious way, perhaps following the study methods we suggest, you should do fine.

Your success will depend primarily on your being able to logically analyze the wording on the chemical problems in homework, quizzes and exams, and relate the problems to basic concepts and mathematical expressions. For most students, the best way to learn the material is to work on the homework problems independently. Good analytical skills and problem-solving techniques must be acquired in order to pass the exams which consist solely of problems - rote memorization of the book will not allow you to pass the course. Memorize by learning, don't learn by memorization. Chemistry is a cumulative subject where one principle builds upon another. This course in general chemistry moves along at a fast pace and you need to stay on top of the material at all times. Experience shows us those students who fall far behind encounter large difficulties and rarely catch up again.

If after careful and extensive studying on your own you do realize that some difficulties remain with understanding the course material, then seek help early! It is often beneficial to study with a friend in the course. A list of office hours for the staff of Solid Gems 165 will be posted. Go to recitation - see any of us during our office hours. We will be glad to assist you as long as you take the initiative.

Formal tutoring assistance is also available at the Learning Resource Centers and the Math and Science Learning Centers. Help is available if you go looking for it.

SOME SUGGESTED STUDY METHODS

1. Do the assigned reading before the lecture. Check for important learning objectives and key concepts at the end of the chapter.
2. Read the assigned reading before coming to the lecture and after the lecture, focusing on the sections emphasized in the lecture and on those sections, if any, that you did not understand completely.

3. Do the assigned homework problems. Check your answer to each problem to make sure you have done the problem correctly. It is extremely important that you make certain that you can do the problem yourself; just understanding it is not enough. The most common trap that diligent (and not so diligent) students fall into is thinking that just because they understand (or think they understand) the solution to a problem, they will be able to do a similar problem on an exam.

4. One simple rule to solve most chemistry problems: **FOLLOW THE UNITS. Do a unitary or dimensional analysis. If the answer comes out to be in the correct units, then 99 times out of 100, your answer will be correct.**

Make a list of questions. When you attempt the homework, divide the problems into three categories: problems you can solve with no or little difficulty, problems that you needed a little hint from the solutions manual or study guide, and problems that you don't even know where to start. The last category of problems should be the first ones you ask about in recitation.

5. Don't stay up late the night before a test. Research shows that being well-rested for a test improves your score much more than last-minute studying. If you don't know the material by the night before the test, you aren't going to learn it overnight. Studying in the last hour before a test actually lowers many students' scores for subjects like the sciences that don't depend on rote memorization. Relax. Don't over-think the questions. Read them carefully.

MATH SHEET

Solid Gems 165 (01:160:165)

Chemistry 161 requires a knowledge of simple algebra. To familiarize yourself with some of the types of mathematical manipulations required in this course, you are strongly urged to perform the calculations shown below.

It is recommended that you refer to these notes to develop the skills needed.

- (I) EQUATIONS (solve for the unknown, X) X
- a. $3X - 32 = (9/5)X$ (2.67×10^1)
- b. $(2X - 4)/6 = 3 - 4X$ (8.46×10^{-1})
- c. $2/X - 1/6 = 1.0$ (1.71×10^0)
- d. $35.45 = 36.97X + (1-X)34.97$ (2.40×10^{-1})
- e. $(1.20)(2.45) = (4.30/X)(0.0821)(300)$ (3.60×10^1)
- f. $(1.34)(2.45) = (1/3)(0.145)(40.0)(X-1)^2$ (2.30×10^0)
- g. $(0.025/0.016) = (44.0/X)^{1/2}$ (1.80×10^1)
- h. $517 = [3(8.31)X/0.0280]^{1/2}$ (3.00×10^2)
- i. $4.86 \times 10^{-7} = \frac{3.00 \times 10^8}{3.29 \times 10^{15} \left(\frac{1}{2^2} - \frac{1}{X^2} \right)}$ (4.00×10^0)

All values of X are calculated to 3 significant figures.

(II) UNIT CONVERSIONS

1. 0.0821 L-atm to Joules (8.32×10^0)
2. 1.08 mile/in³ to km/L (1.06×10^2)
3. 4.82×10^4 cm/s to mile/hr (1.08×10^3)
4. 3.12 lb/ft³ to kg/m³ (5.00×10^1)

(III) SIGNIFICANT FIGURES

1. $6.82 + 2.111 + 1.0712$ (1.000×10^1)
2. $213 - 0.01 - 211.4$ (2×10^0)

3. $(6.40)(12.1) - 2.192$ (7.52×10^1)
4. $4.0 \times 10^2 - 3$ (4.0×10^2)
5. $5.19 \times 10^{-2} + 1.83 + 2.19 \times 10^2$ (2.21×10^2)

GENERAL CHEMISTRY (01:160:165)

SOLID GEMS

SYLLABUS - FALL 2016

<u>LEC#</u>	<u>DATE</u>	<u>ASSIGNMENT</u>	<u>HOME-WORK PROBLEMS</u>	<u>TOPICS</u>
REC 1	9/6 T 9/7 W	1.1-1.7	Math Sheet 1: 35,41,45,49,53,59,61	Classification of
matter, atomic theory				
REC 2	9/8 Th 9/9 F	1.8-1.10	Lecture 1 1: 65,69,73,75,77,91	Subatomic particles,
isotopes,				
		2.1-2.5	2: 17,19,23,27,29,65	Unit conversion
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3	9/12 M	2.5-2.7	2: 71,75	Dimensional Analysis,
SI system of units,				
		App I	2: AppI: 3,7,9,15;	SI system of units,
temperature scales				
		App II,III	2: AppII: 1,3,5,9,11,13	Significant figures
REC 4	9/13 T 9/14 W	2.8 3.1-3.2	Lecture 2,3 2: 49,53,55,57,59,85,89 3: 37,39	Mole concept The Nature of light,
photoelectric effect				
REC 3.1-3.2	9/15 Th	QUIZ I	Lecture 4 Q (L1-4) Quiz will not include material from	
5	9/16 F	3.2-3.3	3: 41,43,69,73,78,85	Atomic spectra, Bohr
model of the atom				
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6	9/19 M	3.4-3.6	3: 51,53,57,59,61,69,71,81	Wave-particle
duality, quantum numbers, orbitals				
REC 7	9/20 T 9/21 W	4.1-4.4	Lectures 5,6 4: 45,49,51,53,55,57	Periodic table,
electron configuration				
REC 8	9/22 Th 9/23 F	QUIZ II 4.4-4.6	Lecture 6 Q (L 4-6) 4: 59,61,63,65,71,73,75	Electron
configurations, periodic trends-atomic radius				

9	9/26 M	4.7-4.8	4: 83,85,87,89,91,93	Periodic trends: Metallic character
REC 10	9/27 T 9/28 W	5.1-5.6	Lecture 7,8 5: 29,39,41,45,47,49,51,53,55,57	Ionic and covalent bonding, polyatomic ions
REC 11	9/29 Th 9/30 F	Review <u>EXAM I</u>	Lectures 1-9 Lectures 1-9	
12	10/3 M	5.6-5.10	5: 59,65,67,69,83,85,87,95	Polyatomic ions, percent composition
REC 13	10/4 T 10/5 W	5.11-5.12	Lectures 10,12 5: 97,99,103,105,107,109,113 121,123	Empirical formula, organic compounds
REC 14	10/6 Th 10/7 F	<u>QUIZ III</u> 6.1-6.3	Lecture 13 Q (L10,12,13) 6: 23,27,29,31,33	Electronegativity Lewis structures
15	10/10 M	6.3-6.4	6: 35,37,39,41,43	Formal charge, resonance
REC 16	10/11 T 10/12 W	6.5-6.6	Lectures 13,14 6: 45,47,49,51,75,77,81, 83,85,97	Exceptions to the bond energies and bond lengths
REC 17	10/13 Th 10/14 F	<u>QUIZ IV</u> 6.7-6.9	Lecture 15 Q (L 14-16) Quiz will not include material 6: 53,55,57,59,61,63,67	VSEPR
18	10/17 M	6.10 22.1-22.3	6: 69,71,73 22: 37,39,43,45	Molecular shapes and polarity of molecules Alkane structure, nomenclature
REC 19	10/18 T 10/19 W	22.3-22.5,22.8	Lectures 16,17,18 22: 51,53,55,95,105	Hydrocarbons, functional groups

REC 20	10/20 Th 10/21 F	Review <u>EXAM II</u>	Lectures 10-18 Lectures 10-18(No Ch 22)	
21	10/24 M	7.1-7.3	7: 31,37,39,41,43,45	Hybridization,
REC	10/25 T		Lecture 18,19	
22	10/26 W	8.1-8.5	8: 15,17,25,27,29,31,33,35,37,39	Chemical equations,
REC	10/27 Th	<u>QUIZ V</u>	Lecture 21 Q (L 18, 19, 21)	
23	10/28 F	8.5-8.6	8: 41,43,45,47,49,51,59,61,63,	Limiting reactant,
			65,67,71	Examples of
				chemical reactions
24	10/31 M	9.1-9.3	9: 21,23,27,29,31,33,35	Solutions, molarity,
REC	11/1 T		Lectures 22,23	
25	11/2 W	9.4-9.7	9: 39,45,47,51,53,55,57,59	Electrolytes,
				acid-base reactions,
				net ionic equations
REC	11/3 Th	<u>QUIZ VI</u>	Lecture 24,25 Q (L 22-25)	
26	11/4 F	9.7-9.9	9: 61,65,67,69	Gas evolution
				reactions, redox reactions
27	11/7 M	10.1-10.5	10: 33,35,41,43,45,47,49,51,53,55	Energy, energy
				transfer,
				Thermodynamics, calorimetry
REC	11/8 T		Lectures 26	
28	11/9 W	10.5-10.8	10: 61,63,67,69,71,73,75	Enthalpy,
				calorimetry, Hess's Law
REC	11/10Th	Review	Lectures 19-26	
29	11/11 F	<u>EXAM III</u>	Lectures 19-26	
30	11/14M	10.9-10.10	10: 77,79,81,83,85,89	Bond energies, heats
				of formation, enthalpies of reactions
REC	11/15 T		Lecture 27, 28, 30	
31	11/16 W	10.11	10: 91,93,95,96	Born-Haber Cycle
REC	11/17 Th	<u>QUIZ VII</u>	Lecture 31, Q (L 27, 28, 30)	
32	11/18 F	11.1-11.3	11: 25, 27,29,31,35	Gases, gas pressure,
				gas laws

33	11/21 M	11.4-11.6	11: 37,39,41,43,51,55,57,59,63,65,69	Ideal Gas Law, partial pressure
REC	11/22 T (Th classes)		Lectures 32, 33	
34	11/23 W	11.7-11.9	11: 71, 73,75,77,79	Kinetic Molecular velocities,
	Theory of Gasses, molecular (F classes) effusion-diffusion			
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35	11/28 M	11.10-11.11	11: 81, 83,85,91,92	Gas stoichiometry,
	real gases			
REC	11/29 T	<u>QUIZ VIII</u>	Lectures 34 Q (L 32-34)	
36	11/30 W	12.1-12.3	12: 33,35,37,39	States of matter,
	intermolecular forces			
REC	12/1 Th	Review 37	Lectures 27-35 12/2 F <u>EXAM IV</u>	Lectures 27-35
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12.6	12: 41,45,47,51,53,55,57			38 12/5 M 12.3- Intermolecular forces, vapor pressure, phase changes,
REC	12/6 T		Lecture 36, 38	
39	12/7 W	12.7	12: 63, 65, 67	Heating curves
		13.1-13.2	13: 19	Phase diagrams
REC	12/8 Th		Lecture 39	
40	12/9 F	13.4	13: 27,29,31,35	Unit cells
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41	12/12 M	13.5-13.7	13: 37, 39,41,45,47	Types of solids
REC	12/13 T		Lectures 40, 41	
42	12/14 W	Review for Final		

Summary of Exams and Quizzes

<u>Exam</u>	<u>Day</u>	<u>Date</u>	<u>Lectures</u>
I	Friday	30 September 2016	1-9
II	Friday	21 October 2016	10-18
III	Friday	11 November 2016	19-26
IV	Friday	2 December 2016	27-35

The Locations of the exams and the final will be announced later

Final Exam FRIDAY 16 December 2016 12:00 PM-3:00 PM

<u>Quiz</u>	<u>Day</u>	<u>Date</u>	<u>Lectures</u>
I	Thursday	15 September 2016	1-4
II	Thursday	22 September 2016	5-6
III	Thursday	6 October 2016	10-13
IV	Thursday	13 October 2016	14-15
V	Thursday	27 October 2016	18-21
VI	Thursday	3 November 2016	22-25
VII	Thursday	17 November 2016	27-31
VIII	Tuesday	29 November 2016	32-34

Lecturer/Coordinator/Administrator

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