

## Chemistry 163 – Honors General Chemistry

**Course Number:** 01:160:163

**Semester:** Fall 2019

**Class Location and Time:** [AB 4400 M 8:25-9:30am](#); [AB 4400 M/Th 9:50-11:10am](#)

**Course Portal:** Canvas <https://tlt.rutgers.edu/canvas>

**Instructor:** Prof. Darrin M. York ([Darrin.York@rutgers.edu](mailto:Darrin.York@rutgers.edu))

Office(s):

[Laboratory for Biomolecular Simulation Research \(CIPR/Proteomics\)](#), Rm 308G

[Cyberlearning Innovation & Research Center \(WL/Chemistry & Chemical Biology\)](#), Rm A205

**Text book (required):**

“**Chemistry: Structure and Properties**”, 2nd Edition, by Nivaldo Tro.

ISBN-13: 978-0-13-429393-6

### Description

This course will focus on the fundamentals of chemistry from a scientific research perspective. The course is intended to train students going on to take higher-level chemistry courses such as organic or physical chemistry, or to major in chemistry or a related field in science, engineering, pharmacy or medicine. A goal of the course is to develop a deep understanding of underpinning chemistry concepts in order to apply them to practical problems. Further, it is anticipated that students in this course will be able to transfer their chemistry knowledge and skills to completely new areas outside the scope of the course.

### Instructor & Facilitators' Office Hours:

Darrin York ([Darrin.York@rutgers.edu](mailto:Darrin.York@rutgers.edu)): TBD, room 206 CIPR

Kiranjot Sethi ([kjsethi@chem.rutgers.edu](mailto:kjsethi@chem.rutgers.edu)): TBD, room 4217 New Chemistry Building

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TIs may conduct additional review sessions before exams - see announcements.

### Pre- and Co-Requisites

Pre-requisite: One year of high school chemistry.

Co-requisite: 01:640:151 or permission from instructor.

### Learning Goals

Core SAS Curriculum Learning Goals Met by this Course



- Understand and apply basic principles and concepts in the physical or biological sciences.

- Explain and be able to assess the relationship among assumptions, method, evidence, arguments, and theory in scientific analysis.

### Department Learning Goals Met by this Course

*By the end of this course, students will be able to draw upon:*

- *relevant scientific models*
- *representations at the macroscopic, submicroscopic (small particle), and symbolic levels—including mathematical formulae*
- *qualitative and quantitative reasoning skills*

*...to demonstrate their understanding (at honors level) that:*

1. **“Atoms:** Matter consists of atoms that have internal structures that dictate their chemical and physical behavior.”
2. **“Bonding:** Atoms interact via electrostatic forces to form chemical bonds.”
3. **“Structure and Function:** Chemical compounds have geometric structures that influence their chemical and physical behaviors.”
4. **“Intermolecular Interactions:** Intermolecular forces—electrostatic forces between molecules—dictate the physical behavior of matter.”
5. **“Chemical Reactions:** Matter changes, forming products that have new chemical and physical properties.”
6. **“Thermodynamics:** Energy is the key currency of chemical reactions in molecular-scale systems as well as macroscopic systems.”
7. **“Measurement and Data:** Chemistry is generally advanced via experimental observations.”
8. **“Visualization:** Chemistry constructs meaning interchangeably at the particulate and macroscopic levels.”

### General Format

The first class period Monday will be in a traditional “lecture style” format. The second class periods on Monday and Thursday will be in an active learning classroom format (see below). Students are expected to participate in discussions both inside and outside of class. Quizzes may be given at the start of class on Thursday. Weekly homework is assigned online and due on Monday morning. Additionally, typically there are warm-up assignments that will be due at the beginning of each active learning session (these are separate assignments). There are two midterm exams, and a cumulative final exam. Additionally, there is a capstone project presentation due at the end of the semester that is peer reviewed.

### Grades and Grading

Class Participation (includes attendance)	10%
Homework/Problem Sets	15%
Midterm Exams (2)	30%
Capstone Project/Presentation	15%
Final Exam	30%

Grades are based on an overall percentage score (0-100) determined from class participation, assigned homework and problem sets, midterm exams, a capstone project/presentation and a final

exam according to the distribution shown above. Each of these is described in further detail below. There are no grade curves in the class – grades are assigned based on the overall percentage score as follows: A ( $\geq 90\%$ ); B (80-89%); C (65-79%); D (55-64%); F ( $< 55\%$ ). In this way, students should not feel in competition with one another for grades – rather the opposite! There are numerous incentives for students to work together and help each other and achieve higher levels of understanding of the material.

**Class participation:** Students are expected to attend, participate and remain engaged during class. Quizzes and other in-class activities will be counted toward the class participation grade. Attendance and engagement in active learning with your team is essential, and is graded. No un-excused absences are allowed.

**Homework/Problem Sets:** Homework and problem sets will be assigned periodically (typically weekly) and can be checked and/or graded. These include “online homework” and warm-up activities”. See the following corresponding sections for detailed instruction.

**Midterm Exams:** There will be 2 midterm exams given in class during the semester on Monday (first period), each lasting 75 minutes. These two midterm exams will cover the entire range of material taught over the semester, and in that sense, together, are cumulative. The exam dates and times can be found on the course schedule. Students are responsible for making it to exams prepared and on time - there are no make-up exams. A description of what you need to bring for an exam can be found here.

**Capstone Project:** Each student will have a capstone project/presentation developed as part of a team. Students will begin work on the capstone projects during the semester, choosing topics, developing outlines and collecting information, data and references. After the second midterm exam, the main focus of the class will be on putting together project presentations. This will occur in two phases. In phase I, students develop story boards and make draft presentations that are posted online and peer-reviewed. In phase II, students revise their presentations based on the peer reviews, and create full project productions. These project final productions are posted online and discussed collectively by the class in forums. A detailed description of the Capstone Project can be found here.

**Final Exam:** There will be 3-hour cumulative final exam. The final exam will be separated into two parts, each part corresponding to material covered in each of the two midterm exams. The exam date and time can be found on the course schedule. Students are responsible for making it to the exam prepared and on time - there is no make-up exam. A description of what you need to bring for the exam can be found here.

### **Other Grade-related Matters:**

*Final Exam.* The final exam is scheduled on **Dec. 23, 2018** – MARK YOUR CALENDARS! This is an immovable date and you must be there for the final – weddings or family events are not valid excuses and make-ups cannot be given, so potential conflicts need to be scheduled around the final exam.

*Grade Inquiries.* If a student has questions or concerns about a graded assignment or assessment, they can bring this to the instructor within 1 week of receiving the grade. This encourages students to promptly go over their graded assignments and assessments and understand their mistakes. If a student disputes a grade, this policy provides a window to bring concerns to the instructor's attention

and request consideration for re-grading. However, request for re-grading *will not be allowed after a week*.

*Absences.* Attendance is mandatory. If a student is absent for a class or one of the midterm exams, the student must fill out a self-reported absence form within 2 days, available at <http://sims.rutgers.edu/ssra>. These will be reviewed and either "excused" or "un-excused" in accord with Rutgers policies (<https://sasundergrad.rutgers.edu/degree-requirements/policies/attendance-and-cancellation-of-classes>). Submission of a self-reported absence form within this time is required in order to become an "excused" absence, but does not guarantee the absence is excused. Un-excused absence will result in a failure grade, and a maximum of 2 excused absences are allowed. In some cases, but not all, missed graded work may be made up in accord with the course policies where such policies exist. Under unusual or extenuating circumstances the instructor can sometimes make special arrangements on a case by case basis.

*Teamwork Incentives.* There is growing evidence that cooperative and team learning are effective ways to improve student learning outcomes in chemistry. This class is all about raising the bar, and helping one another achieve success. Toward this end, students will be assigned to teams, typically consisting of 3 members, to conduct active learning activities in class. Teams are expected to periodically change in order to have students working with a more diverse group of peers. Incentives may be introduced as the course progresses to encourage students to learn from one another and work effectively in teams. Remember – part of the skill set of becoming a scientist is developing the ability to work in an interdisciplinary team to solve high-impact problems. This requires communication and thoughtful discourse to analyze, evaluate and create ideas

### **Online Homework**

Part of your grade will be determined by completion of online homework that will be assigned on a weekly basis. To access the homework assignments:

1. Go to: <https://my.elearning.rutgers.edu>
2. Login with your Net ID and Password.

Before accessing the first assignment you will also have to complete a survey and answer to a consent agreement.

Online assignment will be released every Monday and will be due On Sunday evening. Homework needs to be turned in online before the scheduled deadline - late assignments will not be permitted and not receive a grade. Homework is designed in order to assess mastery of a given topic: each assignment consist of a number of segments and in order **to gain full credits, you have to answer correctly 2 questions in a row.**

If you have any questions or technical issues, you may contact technical support at:

<http://elearning.rutgers.edu/techsupport>

### **Active Learning Classrooms.**

In this class you will engage in active, collaborative learning in chemistry. You will become part of a 3-person peer working group – your learning team – that will work together on activities. At the end of class, each team will hand in a report that documents their progress on activities. All team members are responsible to participate in all activities including discussions and solutions to all

questions and problems. In addition, each team member will have a specific role that will rotate on a weekly basis. These roles include:

- a. **Manager:** Manages the group. Ensures that members are in attendance and fulfilling their roles, that the assigned tasks are being accomplished *on time*, and that all members of the group participate in activities and understand the concepts. The manager is ultimately responsible for handing in the completed activity progress report at the end of class.
- b. **Recorder:** Records the names and roles of the team members (and takes attendance). Records the important aspects of group discussions, observations, insights, obstacles, etc., and fills in sections of the activity progress report handed in at the end of each class. The recorder's report is a concise log of the important concepts that the group has learned.
- c. **Reader/Presenter:** Reads the activity out to the group and makes sure that everyone understands the activity. The reader must monitor speaking volume so that their group can hear them, but other groups are not disturbed. Reports orally to another team or to the class when called for in class discussions and presentations.

**Warm-Up Activity:** To prepare for the activity and get the most out of the class, you are required to read the background material and complete the warm-up activity prior attend the active learning class (ALC). The Monday AL material will be available as PDF files on Canvas on the previous Thursday, and Thursday AL material will be available on Monday. The warm-up activity is due at the beginning of each ALC.

At the end of class, each team will hand in a complete activity progress report, filled out by the recorder and signed by each of the team members.

**Activity Progress Report:** At the end of class, each team will turn in an activity progress report. This report is not graded, it just needs to be honest and complete to be satisfactory. The activity progress report is used to help customize the guidance your instructors can provide each team.

**Quizzes:** Students will take a quiz periodically at the beginning of the active learning class sessions. The quiz score will factor into the students overall class participation grade. Some quizzes may be given through a mobile device, whereas others may not.

**Attendance Policy:** Attendance at active learning class, as in the regular lecture, is mandatory as each student is an integral part of a learning team that includes your peer working group. More than one (excused) absence is not allowed and will result in a student losing their spot in class. If you cannot make this commitment, then this class is not for you.

#### **What will you need for class?**

- Pen/pencil and a notebook
- Calculator
- Textbook "*Chemistry: Structure and Properties*" by Nivaldo Tro (optional)
- Laptop, tablet or other mobile device
- A good attitude and an open mind!

#### **At the Start of Every Class**

- Find your team's table, fill out a name tag (if present), and introduce yourself to anyone you have not yet met.
- Verify the roles of each team member, and take attendance.

- Follow the directions of your instructor, and begin activities promptly when directed. Ask questions, discuss, learn and have fun!

### Academic Integrity

Students must adhere to the university policies on academic integrity and student conduct in all assignments, assessments and other matters regarding this course. These policies can be found online: <http://studentconduct.rutgers.edu/academic-integrity/>

## TENTATIVE CLASS SCHEDULE (SUBJECT TO REVISION)

W	Day/Date	Form	Topic	Reading	Extra Practice Problems (Optional)
1	Th (09/05)	L	Class Introduction	<i>Review:</i> Ch. E & Ch. 1	<b>Ch. E:</b> 21,27,33,41,43,51,53, 63,71,85,91,95,101,103,107 <b>Ch. 1:</b> 39,41,51,55,61,63,67, 71,75,77,79,85,89,91,93 95,105,109,111,113,115
2	M (09/09)	L AL01	Ch. 2: The Quantum Mechanical Model of the Atom	2.1-2.4	<b>Ch. 2:</b> 37,39,41,43,51,53,57, 59,61,67,69,71,73,78,79,81, 85,93,97,101,103
	Th (09/12)	AL02		2.5-2.6	
3	M (09/16)	L AL03	Ch. 3: Periodic Properties of the Elements	3.1-3.5	<b>Ch. 3:</b> 45,49,51,53,55,57,59,61, 63,65,71,73,75,83,85,87,89,91, 93,95,105,121,129,131
	Th (09/19)	AL04		3.6-3.9	
4	M (09/23)	L AL05	Ch. 4: Molecules and Compounds	4.1-4.7	<b>Ch. 4:</b> 29,39,41,45,47,49,51, 53,55,57,59,65,67,69,83,85,87, 95,97,99,103,105,107,121,125, 127,133,139,143,147,151
	Th (09/26)	AL06		4.8-4.12	
5	M (09/30)	L AL07	Ch. 5: Chemical Bonding I	5.1-5.6	<b>Ch. 5:</b> 23,27,29,31,34,35,37,39, 41,43,45,47,49,51,53,55,57,59, 61 63,67,69,71,73,75,77,81,83,97, 99
	Th (10/03)	AL08		5.7-5.10	
6	M (10/07)	L AL09	Ch. 6: Chemical Bonding II	6.1-6.3	<b>Ch. 6:</b> 29,31,33,35,37,39,41,43, 45,49, 57, 69,71,73
	Th (10/10)	Practice exam I		6.4-6.5	
7	M (10/14)		<b>MIDTERM EXAM I</b>		
			<b>Midterm Exam I Reflection</b>		
	Th (10/17)	L	Ch. 7: Chemical Reactions and Chemical Quantities	7.1-7.5	<b>Ch. 7:</b> 15,17,25,27,29,31,33,35, 37,39,41,43,45,47,49,51,59,67, 71
8	M (10/21)	L	Ch. 7 (cont.)	7.6	<b>Ch. 7:</b> 61,63, 65,75,79,83,85,87
		AL10			

	Th (10/24)	AL11			
	Su (10/27)		<b>Capstone Project Topics DUE</b>		
9	M (10/29)	L AL12	Ch. 8: Introduction to Solutions and Aqueous Reactions	8.1-8.6	<b>Ch. 8:</b> 21,23,27,29,31,33,35,37,39,45,47,51,53,55,57,61,63,67,69,71,79,87,91,93,95,99
	Th (10/31)	AL13		8.7-8.9	
10	M (11/04)	L AL14	Ch. 9: Thermochemistry	9.1-9.7	<b>Ch. 9:</b> 33,35,37,41,43,45,47,49,51,53,55,61,63,67,69,91,93,95,96,101,103,107,113,129,131,137 Hess's law: 71,73,75,77,79,81,83,85, 89
	Th (11/07)	AL15		9.8-9.11	
11	M (11/11)	L AL16	Ch. 10: Gases	10.1-10.6	<b>Ch. 10:</b> 25,29,31,33,35,37,41,43 51,55,57,59,63,65,71,73,75,77,79 81,83,85,91,92,95,99,101,123,131
	Th (11/14)	AL17		10.7-10.11	
12	M (11/18)	L AL18	Ch. 11: Liquids, Solids and Intermolecular forces & Ch. 12 (section 4)	11.1-11.6	<b>Ch. 11:</b> 35,39,43,47,49,53,55,57,59,65,67,69,71,73,81,87,95 <b>Ch. 12:</b> 39,41,43
	Tu (11/21)	Practice Exam		11.7-11.9 & 12.4	
13	M (11/25)		<b>MIDTERM EXAM II</b> Midterm Exam II Reflection		
	Th (11/28)	CP	<b>Capstone Project Outline DUE</b> Draft Storyboard		
14	M (12/02)	CP CP	In-class Peer Review Discussion of Revisions		
	Th (12/05)	CP	Presentation Revision and Video Production		
	Su (12/08)		<b>Capstone Presentation Videos DUE</b>		
15	M (12/09)	CP CP	<b>Live Presentations (Network Symposium)</b>		
	Th (12/12)		EXAM REVIEW SESSION (OPTIONAL – LOCATION TBA)		
	F (12/23)		<b>FINAL EXAM 8:11 AM</b>		