CHEMISTRY 109

Fall 2017

109-1: Prof. Etienne Garand (egarand109@chem.wisc.edu)

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Chemistry 109 is a one-semester, accelerated, introductory university course in chemistry. The goals are: 1) to build your skills in problem solving, mathematical and analytical reasoning, and laboratory manipulation; and 2) to build your knowledge of the fundamental chemical principles of atomic and molecular structure, kinetics, and thermodynamics. In this class we will apply these principles to condensation-hydrolysis reactions, acid-base reactions, and oxidation-reduction reactions. We will highlight applications in living organisms, and in the industrial world.

Throughout this course, emphasis will be placed on understanding chemistry and learning to think effectively in solving problems. Successful problem solving requires a basic knowledge of principles, facts, and terms: a vocabulary of chemistry. This course is designed to help you to learn as much chemistry as possible and to perform at the highest possible level. The pace is fast; you should be prepared to work considerably harder than in high school. You will need to devote considerable outside-of-class time to studying chemistry. A good rule of thumb is that you should be spending approximately three hours outside of class for each hour you are in class.

Required Texts & Materials

You will need to purchase each item listed below. These are the only required items for this course.

Textbook: *Chemistry: The Molecular Science* 5th ed. Moore, Stanitski + OWLv2 w/ 24 Months MindTap eReader

Lab Manual: *Chemistry 109 Laboratory Manual, Fall 2017,* Chemistry Department, UW-Madison: Lab manuals will be sold Tuesday, September 5 through Friday, September 15 in the Undergrad Computer Lab (Room 1375) of the Chemistry Bldg. The cost is around $20 and **payment is by WiscCard only**.

Lab Notebook: Carbonless laboratory notebook with duplicate pages: available from Alpha Chi Sigma or local bookstores (where it is more expensive)

Safety Goggles: Industrial quality eye protection—goggles that completely seal around the eyes and fit over regular glasses—is required at all times when you are in the lab. Purchase from Alpha Chi Sigma or local bookstores.

Calculator: A calculator is required. It should have capabilities for square roots, logarithms and exponentiation (antilogarithms), and exponential (scientific) notation operations. You may use programmable calculators in this course.

Web-Based Course Materials and Class Emails

Emails

Much information about this course will be conveyed via email using an automated email list based on registration in the course. An email was sent to everyone on this list before the first whole class meeting. If you did not receive such an email, you are not registered or you are not reading your @wisc.edu emails. We use your @wisc.edu email for UW-Madison communications.

You are encouraged to contact your professor by email if you have questions about anything to do with the operation of the course. As a reminder, a professional email contains a proper salutation, a concise description

of the background and a well-articulated question. Emails that do not follow these criteria may not be answered.

Canvas

Most Chem 109 material is available via a course management system called **Canvas**. You automatically have access if you are enrolled in this course. You may access the Chem 109 Canvas site via the Learn@UW Course Dashboard.

OWLv2

Homework in this course is provided online via **OWLv2**, a system associated with your textbook for which an access code is usually purchased with your textbook. In Canvas you will find directions for registering for OWLv2. **When you register for the first time in OWLv2, use your @wisc email for your email address and use your NetID (i.e bbadger25, not 9074321964) as your "Student ID".**

Piazza

Piazza is a wiki-like question-and-answer system in which you may enter your chemistry question and it may be answered by another student in the class, by a TA, or by your professor. Most importantly, everyone in the class benefits from seeing the answers to all questions. **Please use Piazza for all chemistry questions.** To access Piazza, use the link in Canvas.

Learning Activities in Chemistry 109

Whole Class Meetings

In class your professor will provide an organizational framework, discuss principles, and present illustrations and demonstrations. You should read the assigned sections of the textbook prior to each whole class session. You should take notes during class; note taking should be an active, thinking process. Your notes should reflect your understanding of what you heard and saw. If there are particular concepts or ideas that are not clear to you, you may ask your professor or your TA about them during class, after class using Piazza, or in office hours. Soon after each class, work the related homework questions to build your problem solving skills. Please do not expect to learn everything you need to know in the classroom; you will learn far better by working problems on your own or with a group of other students outside of class.

Discussion Section

Your TA will lead discussions for a group of ~22 students. For each discussion (except Thanksgiving week) there will be a **Pre-Discussion Worksheet** posted in Canvas. **You must turn in your completed worksheet at the beginning of your discussion class period.** After evaluating the pre-class worksheets with the class, your TA will guide you in structured problem solving activities. Discussions will be most valuable if you come prepared. Bring specific questions to ask; be sure you understand the questions asked by others and the answers given by your TA and fellow students. Your active participation will help you and your fellow students learn.

Laboratory

The laboratory exercises are designed to illustrate the principles described in class, and the exams will include questions based upon the laboratory material. **To receive a passing grade in Chem 109, you must successfully complete *all* laboratory assignments and achieve an overall lab score of at least 60%**. If you are unable to attend a specific lab session because of an unavoidable schedule or if you are ill, contact your TA as soon as possible to reschedule. Make-up lab times can be accommodated only during the week when the entire class is doing a lab exercise. Coming to laboratory well prepared and strictly following all safety instructions given by your TA is essential. When in the laboratory you must act in a safe and professional manner. During the lab period you will carry out the experiment, take notes, and complete your data analysis. You will be evaluated on your pre-lab preparation, your in-lab experimental technique and data analysis, and on your ability to observe chemical phenomena and record your observations in your notebook. **The lab report sheet and lab notebook carbon copy are due at the end of each lab session.** If you have special needs or a condition that that might endanger your safety or the safety of others in the laboratory, please inform your professor and TA.

OWLv2 Homework

Each week you will have a homework assignment in OWLv2. **Homework is due every Sunday at 11:55 PM;** you may attempt each question up to three times and your highest score will count. You will not get the same questions as other students do, although most of the questions on your homework will be on the same topics as those for other students. It is possible to save your homework assignment and come back to it later using the "Save and Exit" button. Each question in an assignment has a "Submit Answer" button. You have not completed a question until you click "Submit Answer". Until you click "Finish Assignment" you have not completed an assignment; don't forget to click "Finish Assignment" before you close your browser. **Don't wait until the last minute before the deadline to do your homework!** If you have technical problems please email Dr. Rachel Bain at rbain@chem.wisc.edu. Include your name, this course number (Chem 109), and a description of the problem.

Biomolecules Tutorials and Quizzes

There are four Biomolecules Tutorials and four Biomolecules Quizzes that you will need to complete. Links to the Biomolecules Tutorials and Quizzes will appear in Canvas for the week in which they are due. Each Biomolecules Tutorial has an accompanying quiz that you must complete successfully to receive credit for the tutorial.

Safety Quiz and Academic Honesty Quiz

You must achieve a perfect score on a **Safety Quiz** and an **Academic Honesty Quiz** in Canvas by **11:55 PM Sun. Sept. 17**. These quizzes are listed under the 2nd week's assignment. *If you read the orange safety pages (pp xix to xxii) in your lab manual before taking the Safety Quiz, you should have no difficulty getting a perfect score.*

Exams

There will be three midterm exams of approximately 50 minutes each and a 2-hour final exam. Please note the exam dates on your calendar and avoid scheduling anything at those times. If you have an unavoidable conflict, contact your professor well in advance. If you have special needs, options are available to take the exam at an alternate time or place; please contact your professor. Exam rooms will be assigned later.

Midterm Exams:	Mon. Sept. 25	during class
	Mon. Oct. 23	during class
	Mon. Nov. 20	during class
Final Exam:	**Mon. Dec. 18**	**5:05 PM – 7:05 PM**

Learning objectives for each exam, a selected set of study questions keyed to the learning objectives and two practice exams, may be found in the Exam Preparation modules on the Canvas page.

Academic Misconduct

Academic misconduct includes and is not limited to acts in which a student seeks to claim credit for the work or efforts of another without authorization or citation, uses unauthorized materials or fabricated data in any academic exercise, forges or falsifies academic documents or records, intentionally impedes or damages the academic work of others, engages in conduct aimed at making false representation of a student's academic performance, or assists other students in any of these acts. Examples include but are not limited to: cutting and pasting text from the web without quotation marks or proper citation; paraphrasing from the web without crediting the source; using notes when such use is not allowed; using another person's ideas, words, or research and presenting it as one's own by not properly crediting the originator; stealing examinations or course materials; changing or creating data in a lab experiment; altering a transcript; hiding a book knowing that another student needs it to prepare an assignment; collaboration that is contrary to the stated rules of the course, or tampering with a lab experiment or computer program of another student. Each student in this course is expected to work entirely on her/his own while taking any exam, to complete assignments on her/his own effort without the assistance of others unless directed otherwise by the professor or TA. If you have any questions about an assignment, please ask. Academic misconduct either in lab or lecture will result in a penalty consistent with university policy.

Grades

Your grade will be based on a maximum of 500 points divided as follows:

Safety Quiz and **Academic Honesty Quiz** (2 @ 2 points each)	4 points
Best 16 of 17 OWLv2 Homeworks (16 @ 5 points each)	80 points
4 Biomolecules Tutorials and **Quizzes** (4 @ 5 points each)	20 points
12 Pre-Discussion Worksheets (12 @ 3 points each)	36 points
11 Laboratory Exercises (11 @ 10 points each)	110 points
3 midterm exams (3@ 50 points each)	150 points
Final Exam	100 points
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Total	500 points

Letter Grades.

Final grades will be based upon the absolute scale shown below. If you score the number of points indicated, then you will receive the letter grade indicated, regardless of how many other students achieve the same grade. There is no curve (forced grading distribution); therefore it is to your benefit (and to your friends' benefit) that you help other students learn and they help you learn. After each midterm exam you will be able to determine your probable grade by totaling your earned points, dividing by the total points possible at that time, multiplying by 500, and comparing with this list. If necessary minor adjustments will be made at the end of the semester, but these adjustments will never lower your final letter grade, only raise it. Past experience in Chem 109 is that the class average is about 3.2 on a four-point scale—slightly above a B average.

A	450-500 points
AB	435-449 points
B	415-434 points
BC	390-414 points
C	340-389 points
D	275-339 points
F	< 275 points

CHEM 109 Schedule - Fall 2017

W	Lecture	Subject	Reading	Assignments	Laboratory
1	1) W 9/6	Intro	Ch. 1-3 Appendix A&B	Intro to OWL Assignment (due 9/10@11:55pm) OWL Review Homework 1 (due 9/10@11:55pm)	No lab this week
	2) F 9/8	Atomic Structure	Ch. 5 Sec. 1-5		
2	3) M 9/11	Orbitals and electron configuration	Ch. 5 Sec. 6-8	Pre-discussion worksheet 2 (due in discussion) Safety&Acad. Honesty Quizzes (due 9/17@11:55pm) OWL Review Homework 2 (due 9/17@11:55pm) OWL Homework 1 (due 9/17@11:55pm)	Lab check-in Citizenship in the Lab
	4) W 9/13	Periodic Properties	Ch.5 Sec. 9-12		
	5) F 9/15	Ionic bonds and compounds	Ch.5 Sec. 13 Ch.2 Sec. 4-6		
3	6) M 9/18	Covalent bonds and molecular compounds	Ch. 6 Sec. 1,12 Ch.2 Sec. 7,8 Ch.9 Sec. 7	Pre-discussion worksheet 3 (due in discussion) OWL Homework 2 (due 9/24@11:55pm)	Reaction of Zinc and Iodine
	7) W 9/20	Lewis dot structure	Ch. 6 Sec. 2,3		
	8) F 9/22	Hydrocarbons	Ch. 6 Sec. 4,5		
4	9) M 9/25	Exam #1	Weeks 1-3	Pre-discussion worksheet 4 (due in discussion) OWL Homework 3 (due 10/1@11:55pm)	Investigation of Hydroxyapatite
	10) W 9/27	Bond properties	Ch. 6 Sec. 6-8		
	11) F 9/29	Resonance	Ch. 6 Sec. 9-11		
5	12) M 10/2	Molecular shape	Ch. 7 Sec. 1-4	Pre-discussion worksheet 5 (due in discussion) OWL Homework 4 (due 10/8@11:55pm)	Molecular Structures
	13) W 10/4	Noncovalent interactions	Ch. 7 Sec. 5-6 Ch. 9 Sec 1		
	14) F 10/6	Petrochemistry	Ch. 10 Sec. 1-3		
6	15) M 10/9	Functional groups	Ch. 10 Sec 4-5	Pre-discussion worksheet 6 (due in discussion) Biomolecules Tutorials: Proteins 1&2 Biomolecules Tutorials: Lipids &Carbohydrates Proteins 1&2 Moodle Quiz (due 10/15@11:55pm) Lipids &Carb. Moodle Quiz (due 10/15@11:55pm) OWL Homework 5 (due 10/15@11:55pm)	Structures of Biomolecules
	16) W 10/11	Polymers	Ch. 10 Sec. 6		
	17) F 10/13	Biomolecules	Ch. 10 Sec. 7 Ch. 7 Sec. 7		
7	18) M 10/16	Rate of Reactions	Ch. 11 Sec. 1-2	Pre-discussion worksheet 7 (due in discussion) Biomolecules Tutorials: DNA 1&2 DNA 1&2 Moodle Quiz (due 10/22@11:55pm) OWL Homework 6 (due 10/22@11:55pm)	Esters and Amides
	19) W 10/18	Rate of Reactions Radioactive decay	Ch. 11 Sec. 3 Ch. 18 Sec 1-2		
	20) F 10/20	Nuclear chemistry	Ch. 18 Sec 3-9		

8	21) M 10/23	Exam #2	Weeks 4-7	Pre-discussion worksheet 8 (due in discussion) Biomolecules Tutorials: Enzymes Enzymes Moodle Quiz (due 10/29@11:55pm) OWL Homework 7 (due 10/29@11:55pm)	Neutron Activation of Silver
	22) W 10/25	Effect of Temperature	Ch. 11 Sec. 4-6		
	23) F 10/27	Elementary Reactions	Ch. 11 Sec. 4-6		
9	24) M 10/30	Reaction Mechanisms	Ch. 11 Sec. 7	Pre-discussion worksheet 9 (due in discussion) OWL Review Homework 3 (due 11/5@11:55pm) OWL Homework 8 (due 11/5@11:55pm)	Kinetics of Erioglaucine with Sodium Hypochlorite
	25) W 11/1	Catalysis and Enzymes	Ch. 11 Sec. 8-10		
	26) F 11/3	Thermochemistry	Ch. 4		
10	27) M 11/6	Entropy	Ch. 16 Sec. 1-5	Pre-discussion worksheet 10 (due in discussion) OWL Homework 9 (due 11/12@11:55pm)	Enzyme Kinetics
	28) W 11/8	Gibbs free energy	Ch. 16 Sec. 6		
	29) F 11/10	Chemical Equilibrium	Ch. 12 Sec. 1-4		
11	30) M 11/13	Le Chatelier's principle	Ch. 12 Sec. 5-7	Pre-discussion worksheet 11 (due in discussion) OWL Homework 10 (due 11/19@11:55pm)	Chemical Equilibrium & Le Chatelier's Principle
	31) W 11/15	Equilibrium and free energy	Ch. 16. Sec. 7		
	32) R 11/17	Kinetic Stability	Ch. 16. Sec. 8-11 Ch. 12 Sec. 8		
12	33) M 11/20	Exam #3	Weeks 8-11	No discussion this week No Homework this week	No Lab this week
	34) W 11/22	Acids and Bases	Ch. 3 Sec. 4 Ch. 14 Sec. 1-4		
13	35) M 11/27	Acids and Bases	Ch. 14 Sec. 5-8	Pre-discussion worksheet 13 (due in discussion) OWL Homework 11 (due 12/3@11:55pm)	Chemical Equilibrium and Thermodynamics
	36) W 11/29	Buffers	Ch. 15 Sec. 1		
	37) F 12/1	Acid-Base Titrations	Ch. 15 Sec. 2		
14	38) M 12/4	Redox Reactions	Ch. 3 Sec. 5, Appendix F Ch. 17 Sec. 1-3	Pre-discussion worksheet 14 (due in discussion) OWL Homework 12 (due 12/10@11:55pm)	Electrochemical Cells Lab check out
	39) W 12/6	Cell potential	Ch. 17 Sec. 4-5		
	40) F 12/8	Electrochemical Cells	Ch. 17 Sec. 6-7		
15	41) M 12/11	Electrochemical Cells	Ch. 17 Sec. 8-9	No discussion this week OWL Homework 13 (due 12/13@11:55pm)	No Lab this week
	42) W 12/13	Electrochemistry	Ch. 17 Sec. 10-12		
FINAL EXAM M 12/18, 5:05-7:05 pm (Week 1-15)					