

Chemistry 112B Organic Chemistry

Section 1 - Fall 2021

Contact Information

Instructor:	Roy K. Okuda, PhD
Office Location:	Duncan Hall 9A*
Telephone:	(408) (924-2525)*
Email:	roy.okuda@sjsu.edu
Office Hours:	Tues 3:00 to 4:25pm; Wed 10:30 – Noon <u>held by Zoom only</u>
Class Days/Time:	Lecture TR 9:00am - 10:15am
Classroom:	Held by Zoom only (fully online)
Prerequisites:	CHEM 112A (with a grade of "C" or better; "C-" or lower grade not accepted).

*due to COVID-19 restrictions, I will not be available in my office this semester; contact me by email or during scheduled Zoom sessions.

Faculty Web Page and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on the Chem 112B Canvas page for this course. I will also use the email address listed on your mySJSU account regularly to send information on Chem 112B (make sure your email is current). You are responsible for checking for messages on this email on a regular basis to learn of any updates. Many important files will be posted to Canvas, so be sure you can access Canvas from your computer. Lectures and office hours will be conducted using Zoom.

Course Description

Chemistry 112B is the second semester of the full-year sequence of Organic Chemistry, and may be taken only by students who have completed Chemistry 112A and received a grade of "C" or better. **Chem 112A may not be taken concurrently with Chem 112B.**

While most of the basic concepts of organic chemistry were introduced in Chemistry 112A, you will find that Chem 112B is a dramatically different course. In Chem 112B, a much greater emphasis is spent on the reactions of the various classes of organic compounds. Students are often surprised at the difference in the two courses – even if you did well in Chem 112A, most of the material in 112B will be completely new and the application of the information will require a very different approach compared to the first

semester. There is also a lot of new material so it will be essential for you to not fall behind at any time. Compared to Chem 112A, most students find they need to put in a lot more time to get through 112B

Note that while the exams will emphasize the most recent topics covered in class, 112B is based on the material you learned in 112A. Topics covered in class will refer to concepts from 112A, and you can expect that exam questions will involve material from 112A. Note that each exam (Hour Exams and Final) will be cumulative for all material covered previously from both Chem 112A and Chem 112B. Information on the final exam will be provided prior to the exam.

Course Goals and Learning Objectives

Course Learning Outcomes (CLOs)

- Demonstrate understanding of core concepts and to effectively solve problems in organic chemistry.
- An understanding and ability to apply all material covered in Chem 112A (McMurry Chapters 1 to 11)
- Appreciation for the nature and scope of organic chemistry.
- Application of key concepts from general chemistry including electronegativity, bonding (ionic and covalent), hybridization of atomic orbitals, and molecular orbital theory to organic systems.
- Draw valence bond and Lewis dot structures for organic species, including formal charges and oxidation numbers.
- Draw structures for organic compounds in a variety of methods (including, but not limited to, line-bond, Lewis Dot, dash/wedge, Fisher, Haworth projections); show stereochemistry and regiochemistry accurately.
- Apply acid-base concepts to organic systems; predict ordering of acid or base strength; understand the roles of acids and bases in reaction mechanisms.
- Name the various forms of carbonyl-containing compounds, amines, carbohydrates, lipids, nucleic acids, amino acids and their various derivatives using systematic (IUPAC) nomenclature.
- Learn common names and acronyms for key chemicals and solvents.
- Understand the concept and definitions of aromaticity.
- Draw products and reaction mechanisms for many reactions including all reactions from Chem 112A, aromatic compounds, alcohols, phenols, thiols, ethers, sulfides carbonyl-containing compounds, amines, carbohydrates, amino acids, lipids. Nucleic acids.
- Recognize stereochemistry and be able to apply the Cahn-Ingold-Prelog system to designation of stereochemistry (E/Z, R/S, *re/si*).
- Apply stereochemical aspects to reaction mechanism.
- Understand the fundamentals of reaction kinetics and be able to apply to the determination of reaction mechanism.
- Employ the reactions learned in designing multistep organic synthesis.
- Learn and be able to apply the new material presented in Chapters 14 - 28 in the text (McMurry, 9th edition) as well as additional topics presented in lecture. Knowledge and application of information presented in Chem 112A (Chapters 1 to 11) is also expected.

Program Learning Outcomes (PLO) – SJSU Department of Chemistry

I. Core Chemistry Ideas (Fundamentals)

PLO 1.1 - Students will be able to identify, formulate, and solve a range of chemistry problems (fundamental to complex) through application of mathematical, scientific, and chemical principles.

PLO 1.2 - Students will be able to recognize, relate, and/or apply chemistry terms and concepts to propose and solve interdisciplinary and multidisciplinary real world problems.

II. Experimentation/Lab Practice

PLO 2.1. Students will be able to develop an experiment to address a hypothesis using literature and execute the planned experiment using standard chemistry techniques.

PLO 2.2 Students will be able to acquire, record, and critically evaluate data through use of instrumentation and software, appropriate record keeping practices, figure preparation, and scrutiny of experimental results.

PLO 2.3 Students will be able to recognize and assess laboratory hazards, practice risk minimization, and conduct safe laboratory practices.

III. Community, Social, Societal Implications

PLO 3.1 Students will be able to explore, critique, and reflect on how chemistry relates to society, culture, and issues of equity and ethics that shape their scientific beliefs and identities.

PLO 3.2 Students will be able to identify as scientists within the scientific community through constructing peer reviews, engaging in collaborations, and participating in mentorship.

IV. Communication Skills

PLO 4.1 Students will be able to design and deliver engaging presentations on diverse chemistry topics in a professional manner and with clear, concise organization that demonstrates mastery of the topic.

PLO 4.2 Students will be able to integrate research findings into a concise original written report that either analyzes collected data and obtained results or reviews and reflects on published scientific work.

PLO 4.3 Students will be able to identify an audience and construct a message tailored to that audience and act as a science ambassador by conveying the importance of the research or topic of study.

PLO 4.4 Students will be able to prepare professional documents, such as résumés and cover letters, that accurately represent the students' skills and knowledge for graduate/professional school or potential future employers.

Required Texts/Readings

Textbook

McMurry, John. *Organic Chemistry*, 9th ed., Thomson•Brooks/Cole - either the hardcover or softcover SJSU edition is acceptable. Earlier editions of McMurry are NOT acceptable for this course. If you already purchased this text for Chem 112A, you do not need to buy it again!

Electronic Device and Internet Requirements:

The lectures and office hours will be given using Zoom; lecture recordings and class material will be posted on Canvas. Access to all parts of Chem 112B requires you to both be a registered SJSU student and enrolled in the course (authentication will be required).

To view the lectures and material on Zoom and Canvas, you must have a suitable device that allows you to access and view these programs.

For exams on Canvas, the following apply

- you will need a laptop, desktop or tablet to take the exam (smartphones should NOT be used); install the latest browser (Chrome or Firefox recommended)
- a second device, such as a camera phone is required for video proctoring
- Respondus Lockdown Browser must be installed (more information on this later)
- IMPORTANT: the exams involve large data and image files. Your internet connection must be strong and reliable to accommodate rapid transfer of information.
- additional information will be provided prior to each exam

Optional, but highly recommended:

-OWL is a companion web package that comes bundled with the McMurry text when purchased from the Bookstore. It has it contains additional problems and other resources. If you have the text from other sources, you can purchase an OWL access card from the Bookstore.

- A set of molecular models for organic chemistry (a basic kit by Maruzen is sold by the SJSU Bookstore; other versions may be available from other sources)

Library Liaison

The Chemistry Library Liaison is Yen Tran (yen.tran@sjsu.edu)

Course Requirements and Assignments

Catalog Description Continuation of CHEM 112A. Prerequisite: CHEM 112A (with a grade of "C" or better; "C-" not accepted).

You must complete Chem 112A with a grade of "C" or better; you may not take Chem 112A concurrently with Chem 112B! Anyone found to have not satisfied the prerequisite may be dropped from Chem 112B at any time during the semester.

The scheduled weekly time for this course is TR 9:00am to 10:15am. Lectures will be given using Zoom and exams using Canvas Quizzes and Assignments. A Zoom link will be emailed to you shortly before each lecture or exam.

Tentative Course Calendar:

A tentative schedule for the semester appears at the end of this document. Note in particular the dates for the three Hour Exams and Final Exam. ALL exams will be given using Canvas Quizzes and Assignments during only the announced times.

FINAL EXAM Friday, Dec 10, 2021 7:15am to 9:30am

Mark all exam dates on your calendars now. DO NOT arrange any travel, personal, or business absences on exam dates.

Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction or preparation/studying or course related activities including but not limited to internships, labs, clinical practice. Other course structures will have equivalent workload expectations as described in the syllabus.

Attendance Policy

You are required to attend every class meeting for this section of Chem 112B. DO NOT enroll in this class if you cannot attend every class session due to work or other commitments. I see a very clear correlation in the performance of students who do and who do not attend lectures regularly. Those who do not attend lecture do poorly, and many do not pass 112B. Trying to learn the material by only reviewing the video lectures does not work for most students. In lecture, I focus on the most important information from the textbook, and you are more likely to pick up on key information if you hear it when presented live. Additionally, a significant amount of information is not from the textbook and will only be covered in lecture.

*I will not enforce this policy, but the point is that attendance is **essential** to do well in this course. If you don't attend classes regularly, your chances of success are much lower.*

Please join Zoom in time for the 9:00am start of Chem 112B.

University policy F69-24: "Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active

participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading.”

Grading Policy

GRADING (see below for numerical breakdown and percentages)

There will be 3 "Hour" exams (each approx. 60min) given throughout the semester, each with a maximum score of 150 points. The Final exam will be worth a total of 200 points. To receive a grade in this course, you are required to take any two Hour Exams plus the Final Exam. If you take all 3 Hour Exams, the two highest scores will be used in the calculation of your grade. If you do not take one of the Hour exams, *for any reason*, this will be the score which will not be used in the grade calculation. The Hour exams will be given at the start of the lecture period on Canvas. Plan to arrive on time (to Canvas) when an exam is scheduled, since all students will have the same start and end time, no extra time is provided if you start late. **Note you must take 2 Hour Exams (at minimum) and the Final Exam; if you fail to do this, a passing grade will not be given.**

All exams will be given using Canvas Quizzes and video proctoring is mandatory, or your exam will not be used in your grade calculation. See below for information.

The final exam will be comprehensive for all material covered in BOTH semesters Chem 112A and 112B, and will be worth 200 points. Specific details will be given before each exam, but in general they will be a mixture of multiple choice/true-false/short answer, and questions with written answers which will be submitted as a Canvas Assignment.

Your final grade will be based on:

- 300 points for two Hour exams (2 x 150 points)
- 200 points for the Final (you can't drop the final)

TOTAL 500 points

Grades will be assigned on a "+/-" system. The course grades will be assigned according to the following ranges:

A+ = 100-97%	A = 96-93%	A- = 92-90%
B+ = 89-87%	B = 86-83%	B- = 82-80%
C+ = 79-77%	C = 76-73%	C- = 72-70%
D+ = 69-67%	D = 66-63%	D- = 62-60%
F = <59% Unsatisfactory		

Note these are general ranges and may be modified based on the performance of the class. Any modifications will be in your favor, but you should not expect significant changes. Note that the "class average" for a given exam is *not necessarily a "C" grade.* *Grades are assigned by grade ranges, not by "curves."*

It is possible to do poorly on one exam, but you may improve your overall grade by doing well in another exam, especially since one exam is not counted.

IMPORTANT: In assigning grades, only one set of criteria are applied equally to all students in the class - everyone has the same opportunity as everyone else to earn their grade. I cannot make special “arrangements” for an individual student.

Note that "incomplete" grades will only be considered if you have an unexpected situation or emergency that prevents you from finishing the semester. It is required that you have completed most of the course work with a passing grade until that point. A typical situation is a medical emergency just before the Final Exam - to be considered you must provide verifiable information on the emergency, such as a note from your doctor (must be on official stationary with an original signature with contact information). Poor performance in the class or inability to keep up with the material is not an acceptable reason for an incomplete or to drop the class.

If you have not completed sufficient exams to calculate a course score at the time grades are submitted at the end of the semester, a grade of “WU” will be assigned. This includes if a late drop is pending when grades are submitted.

EXAM POLICIES:

- **Respondus Lockdown Browser will be used for every exam**
- ***You must join Canvas using your personal SJSU authentication.***
- ***For the duration of the exam, you must join the Zoom link provided and be visible on video, for proctoring.***
- ***Calculators, computers, cellphones, or any other electronic devices that can photograph, record, and / or transmit images of any kind, or which can access any information, are NOT allowed during exams. No notes or other sources of information are allowed. Anyone found violating this rule will receive, at minimum, an automatic score of "0 points" for the exam and this exam will be counted as one of the 2 hour exam scores (the second highest score will not count). Additional judicial sanctions will apply. See Academic Integrity section below.***

Other Class Policies:

Exam Makeup and Regrade Policy:

You are required to take any 2 of the 3 Hour exams given. If an Hour exam is not taken *for any reason*, that exam will be the one exam score that is not counted. A makeup will only be considered if you miss a second Hour exam due to an unforeseen emergency and provide a verifiable reason. In all cases, you must contact me as soon as reasonably possible. Before any action may be taken, you will be required to provide a verifiable document describing your emergency with the doctor's name and phone number. Note this only applies if you miss a second hour exam due to unexpected reasons. It is your responsibility to contact me as soon as possible, and by the last day of classes. Travel for personal or business reason is not a justifiable reason to miss an exam. For example, if you only take one Hour Exam and the Final Exam, a passing grade will not be given (see Grading Policy above).

Any request for a regrade or recalculation of any exam must be made *within one week after the exam is posted on Canvas*. No regrades will be considered beyond this time.

The Final Exam is not returned, but may be viewed in the next semester during my office hours. Ask me at least a few days before you plan to view your exam during my office hours.

Academic Integrity for Chem 112B

Your commitment as a student to learning is evidenced by your enrollment at San Jose State University. The University Academic Integrity Policy S07-2 at <http://www.sjsu.edu/senate/docs/S07-2.pdf> requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The [Student Conduct and Ethical Development website](http://www.sjsu.edu/studentconduct/) is available at <http://www.sjsu.edu/studentconduct/>.

Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person's ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified. If you would like to include your assignment or any material you have submitted, or plan to submit for another class, please note that SJSU's Academic Integrity Policy S07-2 requires approval of instructors.

For Chem 112B, any form of cheating or unfair advantage will be dealt with seriously in this course, and will result in an appropriate penalty. At minimum, an infraction will result in "0" points for that exam and it will count as one of two Hour Exam Scores (meaning the second highest exam score will be dropped); a grade of "F" for the course may also be given. The SJSU "Policy on Academic Dishonesty" as described in detail in the SJSU Catalog will be the guideline for any action taken, and the case will be referred to the SJSU Office of Judicial Affairs. The instructor or the SJSU Office of Judicial Affairs may apply more serious penalties. An infraction may also result in a student's name being placed in a Chemistry Department file and other sanctions.

Campus Policy in Compliance with the American Disabilities Act

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. [Presidential Directive 97-03](http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf) at http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf requires that students with disabilities requesting accommodations must register with the Accessible Education Center (AEC) at <http://www.sjsu.edu/aec/> to establish a record of their disability.

Note that accommodations for exams should be made well in advance of the exam date, since both I and the AEC need to make arrangements. Contact AEC well in advance of the first exam and arrange for your paperwork to be sent to me. Please note the following:

-exams to be accommodated must be given at times which overlap the time when the class will be taking it

-please send me an email a day or two before each exam to remind me to program Canvas for your accommodation.

Add / Drop Policies

Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Refer to the current semester's [Catalog Policies](http://info.sjsu.edu/static/catalog/policies.html) section at <http://info.sjsu.edu/static/catalog/policies.html>. Find calendars and information on adding or dropping courses on the Registrars page:

<https://www.sjsu.edu/registrar/>

Various forms and instructions are found here:

<https://www.sjsu.edu/registrar/forms/>

Note the Late Drop form states you should first consult with your academic advisor before submitting the form. If you ask me to sign a Late Drop Petition, I will ask you to verify that you have done so.

[the following are miscellaneous policies that are mandated by SJSU. Some are obviously not relevant while we are under COVID safety protocols, but I will leave them here for general information]

•Emergencies and Building Evacuations (obviously not relevant now, but I am required to include this):

If you hear a continuously sounding alarm, or are told to evacuate the building by an Emergency Coordinator, walk quickly to the nearest exit (facing Tower Lawn). Take your personal belongings as you may not be allowed to return. Follow the instructions of the Emergency Coordinators. Be quiet so you can hear instructions. Once outside, move away from the building. Do not return to the building unless the Police or the Emergency Coordinator announces that this is permissible.

University Policies

As a student at SJSU, you should review these University Policies which apply to ALL university courses.

<http://www.sjsu.edu/gup/syllabusinfo/#GeneralExpectations>

The topics include the following:

[General Expectations, Rights and Responsibilities of the Student](#)

[Dropping and Adding](#)

[Consent for Recording of Class and Public Sharing of Instructor Material](#)

[Academic integrity](#)

[Campus Policy in Compliance with the American Disabilities Act](#)

[Student Technology Resources](#)

[SJSU Peer Connections](#)

Advice for Students Taking Chem 112A and 112B (FROM other students!):

Over the years, I have asked students who have done well in Chem 112A and 112B what their "secrets" are - here are the most common responses:

- keep up with the course, don't ever fall behind
- attend every lecture and take copious notes (listen for hints)
- read the text before and after each lecture
- copy (by hand) your lecture notes soon after the class
- work the problems immediately after they are discussed in class (there is no way to catch up if you try to do this just before the exam); do ALL of the problems in the book and provided problem sets on Canvas and in-class problems
- don't memorize answers to specific problems; you need to understand how to determine the answer from principles since questions can be posed in different ways.
- what NOT to do is to wait until just before the exam to start learning the material!
- organize Study Groups with classmates and work on 112B on a weekly schedule (and stick to it!).

You will likely hear much griping about how "difficult" O-chem is, but you typically don't hear from the students who follow the advice above and do well in the class. I can't promise success for everyone, but you will very likely do much better if you follow all of these items. [IMPORTANT: you have to follow all of the items, not just some!]

I will frequently post problem sets and other information on the Chem 112B Canvas site (see "Files") - check this page regularly.

MY BEST ADVICE TO YOU:

If you feel at some point in the semester that you are "lost" or not doing as well as you like, come see me or take advantage of the available Resources listed below immediately for assistance. If you wait until right before an exam or until the last few weeks of classes, it will be very difficult to catch up due to the volume of material. Keeping up with the material and working the problems is very important to succeed in Chem 112B. *However, it is also true that spending many hours studying does not necessarily equate to doing well on the exam - what is important that you **understand** the underlying principles and know how to apply them, not just memorize information or know how to answer specific problems from the textbook or sample exams.*

Office Hours and Email Questions:

The University requires me to post 2 hours of office a week, but I regularly schedule at least 3 hours/week. I will also try to schedule extra "floating" office hours - I'll announce these in advance. My office hours are times dedicated to assist you and students in all of my courses. They are usually quiet except immediately before exams, so if you have questions, see me early and not wait until the pre-exam rush, when many students show up - I can answer only a limited number of questions from a large crowd.

I am also open to email questions at any time, so you do not have to wait until the next office hour. Unless I'm traveling, I try to answer emails 7 days a week, and usually reply within a day (understand that I usually answer these emails on my personal time - I do my best to reply in a timely manner but may not be available every evening or weekend). This service is there for you to use, but you have to take the initiative!

My email is roy.okuda@sjsu.edu (put "112B" in the subject line so I know it's not spam)

Some important points regarding email questions:

- If your question is related to a point in the textbook, include the page number or problem number. I don't carry the book with me at all times, so sometimes I may have to wait until I have a copy of the text in hand.
- this service is intended for a reasonable number of questions. If you need many questions answered, I will ask you to come to office hours.
- note that it is very time-consuming for me to prepare each exam using Canvas, so I have to impose a 24 hour time limit for questions to come in before each exam.
- Email is only for questions about course material and problems. Because of the COVID situation, I cannot meet you in person if you have a private issue. . If necessary, we can arrange a private time to talk via Zoom or phone.
- prior to each exam, in lecture (mandatory) I always will give you the limits of the topics to be covered in the exam. The provided Schedule is tentative, and we may or may not follow it closely.

OTHER RESOURCES:

- COSAC (College of Science Student Advisory Center) has student tutors who are available for walk-in or scheduled assistance with questions - <http://www.science.sjsu.edu/cosac/>
 - Academic Workshops are primarily problem-solving sessions
 - Peer Connections Resource Center
- Note I do not have any oversight on these resources.**

CHEMISTRY 112B - ORGANIC CHEMISTRY (OKUDA)

Section 1 - FALL 2021

*Tentative Schedule (subject to change)**

Date	Topic	Reading in McMurry	Suggested Exercises from the END of the chapter** (<u>do ALL the problems within the chapter</u>)
AUG 19	Introduction: Dienes	14: 1-6	1 – 12; 16 - 40
AUG 24	Dienes		

AUG 31	Aromaticity	15: 1- 6	15: 15-38; 53 (imp.!)
SEP 2	Aromatic Reactions	16: 1-5	16.24 to 16.43;
SEP 7	Aromatic Reactions	16: 1-5	16.24 to 16.43;
SEP 9	Benzene Reactions (EAS, NAS, other rxns)	16: 6 - 10	16.46 to 16.67; 16.72 to 16.77
SEP 14	Alcohols & Phenols	17: 1- 10	17.20 to 17.50;17.57 to 17.65; 17.70, 17.72
SEP 16	Ethers, Epoxides, Thiols, Sulfides	18: 1 - 8	18.19 to 18.31; 18.38 to 18.47
SEP 20	Carbonyl Preview: Aldehydes & Ketones	pp. 595-603; 19: 1 - 3	19.27 to 19.43
SEP 21	HOURLY EXAM 1		
SEP 23	Aldehydes & Ketones	19: 5 - 9	19.45; 19.52; 19.54 to 19.65
SEP 28	Aldehydes & Ketones	19: 11 -13	19.76 to 19.78
SEP 30	Carboxylic Acids & Nitriles	20: 1 - 4	20.17 to 20.27
OCT 5	Carboxylic Acids & Nitriles	20: 5 - 7	20.31 to 20.37; 20.43 to 20.50
OCT 7	Carboxylic Acid Derivatives	21: 1 - 4	21.27 to 21.36
OCT 12	Carboxylic Acid Derivatives	21: 5 - 7	21.37; 21.45 to 21.57
OCT 14	Carboxylic Acid Derivatives	21: 8 - 9	21.60 to 21.62
OCT 19	Hour Exam 2		
OCT 21	Carbonyl α -substitution Rxns	22: 1 - 4	22.17 to 22.24; 22.30 to 22.32
OCT 26	Carbonyl α -substitution Rxns	22: 5 - 7	22.37 to 22.46; 22.50 to 22.60
OCT 28	Carbonyl condensation	23: 1 - 5	23.23 to 23.32
NOV 2	Carbonyl condensation	23: 6 - 9	23.43 to 23.46
NOV 4	Amines	24: 1 - 4	24.26 to 24.33; 24.47 to 24.64
NOV 9	Amines	24: 5 - 9	24.68 to 24.77 to 24.80
NOV 11	VETERAN'S DAY		
NOV 16	Carbohydrates	25: 1 - 11	25.26 to 25.35
NOV 18	Hour Exam 3		
NOV 23	Amino Acids & Proteins	26: 1 - 11	26.19 to 26.51
NOV 25	THANKSGIVING DAY		
NOV 30	Lipids and Natural Products	27: 1 - 7	27.11 to 27.37; 27.46
DEC 2	Biomolecules: Nucleic Acids	28: 1 - 8	28.13 to 28.18
Dec 10	FINAL EXAM		

**any changes may be announced only in lecture. It is your responsibility to be aware of any changes*

**every problem has a value, so I suggest you also work on the ones not listed here (as well as problems from Canvas and other sources).

Final Exam: Friday, Dec 10, 2021 7:15am to 9:30am

Mark this date and time for your Final Exam on your calendars NOW! (or when they are posted)

TIP: we will not cover spectroscopy in Chem 112A/112B. However, when you take Chem 113A, review the material on IR and NMR spectroscopy in McMurry Chapters 12 and 13, which will give you a good introduction to these topics. NMR and IR are an important part of Chem 113A.