ORGANIC CHEMISTRY II: CHEMISTRY 360 SYLLABUS (Course ID = 000593)
Online Class - Spring 2022

Dr. Craig P. Jasperse	web: https://collaborate.mnstate.edu/public/blogs/jasperse/online-organic-chemistry-courses/online-organic-chemistry-ii-360-summer/ or http://web.mnstate.edu/jasperse/Online/chem360online.htm (classic) Zoom-Room: https://minnstate.zoom.us/j/8827046226
Office: Hagen 407J	e-mail: mailto:jasperse@mnstate.edu
Telephone: (218) 477-2230	Office Hours: M-T-W-F 9-11:30 (but many other M-T-F afternoons available, too….)

ORGANIC CHEMISTRY I: CHEMISTRY 360-ONLINE SYLLABUS
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Dr. Craig P. Jasperse	web: https://collaborate.mnstate.edu/public/blogs/jasperse/online-organic-chemistry-courses/online-organic-chemistry-ii-360-fall-spring/ or http://web.mnstate.edu/jasperse/Online/chem360online.htm (classic) Zoom-Room: https://minnstate.zoom.us/j/8827046226
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Course Description: **CHEM 360. Organic Chemistry 2. 3 Credits**. The structure, nomenclature, reactions, reaction mechanisms, and synthesis of carbon compounds that contain oxygen and nitrogen. Prerequisites: CHEM 350 (Organic Chemistry I).

Required Text and Materials:

1) Text: "Organic Chemistry", 8th edition OR 7th edition OR 6th edition, by Wade (Note: if you have a different Wade edition, or a version of Carey's Organic Chemistry as used at NDSU, contact me in order to use what you have.)

Note: These aren't the newest versions, so you can buy used ones cheaper on-line. See website for Amazon links to cheap copies: http://web.mnstate.edu/jasperse/Required-Text-and-Materials.pdf

2) Solutions Manual: "Solutions Manual, Organic Chemistry." Get the edition that matches the textbook edition you buy. (In other words, if you have 8th edition test, make sure you get the 8th edition solution manual, etc.)

3) Online "Achieve" homework. https://achieve.macmillanlearning.com/start

Test Schedule

Test #1 (100 pts)	Ch. 10 Structure and Synthesis of Alcohols Ch. 11 Reactions of Alcohols
Test #2* (**50** pts)	Ch. 13 Nuclear Magnetic Resonance Spectroscopy Ch. 12 Infrared Spectroscopy
Test #3 (100 pts)	Ch. 18 Ketones and Aldehydes Ch. 22 Alpha Substitutions and Condensations of Enols and Enolate Ions
Test #4 (100 pts)	Ch. 19 Amines Ch. 20 Carboxylic Acids Ch. 21 Carboxylic Acid Derivatives
Final Exam (150 pts) Complete by May 11	Cumulative Final Exam

Grading Summary:

Tests	350 points
Final exam	150 points
Take-Home Quizzes	20 points
On-Line Homework	80 points (prorated)

Tentative letter grades

A/A-	≥90%
B-/B/B+	≥80%
C-/C/C+	≥70%
D-/D/D+	≥58%

- The instructor may lower but will not raise the numbers required for a letter grade.
- Final Exam: The final exam will be cumulative, covering the Organic II semester.

Jasperse website: https://collaborate.mnstate.edu/public/blogs/jasperse/online-organic-chemistry-courses/online-organic-chemistry-ii-360-fall-spring/ or http://web.mnstate.edu/jasperse/Online/chem360online.htm (classic). This will provide links to:

Notes for use in class	Recorded Lectures	Achieve	Quizzes	
Practice Tests	Practice Sets	Jasperse Schedule	Textbook Info	Miscellaneous

Student Learning Outcomes/Course Objectives

The general outcome goals are that students will understand the structure, characterization, nomenclature, reactions, reaction mechanisms, and synthesis of carbon compounds including those that contain oxygen and/or nitrogen, see above. A more detailed list of learning topics is summarized on page 3, with an approximate lecture-by-lecture listing of topic coverage, and on pages 20-24. Most of the learning outcomes will be assessed by problems in which students must demonstrate their understanding. The list of problems on page 3 represents a detailed and representative sampling of the types of problems that should be solvable by a student who has achieved all the learning outcomes.

Schedule: Which Lecture Videos and Practice-Set Videos Go with Each Test

Video	Chemistry 360, Jasperse, Wade 8 (43 class days, 39 lectures) Other version or other textbooks, if you bought the cheaper Version 7 (or 6): http://web.mnstate.edu/jasperse/Chem360/Other%20Books-Problems%20and%20Readings%20342/Other%20Books-Problems%20and%20Readings.htm Topic		Reading Assignment
	TEST 1 LECTURES. Alcohol Chemistry. Synthesis, Reactions, Retrosynthesis		
1	Intro; Structure, Nomenclature, Properties, Weak Acidity of Alcohols		10.1-10.6
2	Synthesis of Alcohols; Organometallic Reactions.		10.7-10.9
3	Synthesis of Alcohols; Organometallic Reactions.		10.7-10.9
4	Side Reactions; Reduction of Carbonyl Compounds		10.10-10.11
5	Oxidation of Alcohols		11.1-11.3
6	Conversion of Alcohols to Tosylates or Halides; Uses of Tosylates and Halides		11.5-11.9
7	Miscellaneous; Chemical Tests; Multistep Synthesis		11.10, 11.14
8	Retrosynthetic Analysis		
9	Catchup, Multistep Synthesis Problems		Catchup
10	Review for Test 1		---
	Additional Practice Sets/Videos: Retrosynthesis Problems; Acid-Base Practice; Mechanisms Problems **Test 1 Practice Tests**: V1, V2, V3, V4		
	TEST 2 LECTURES. NMR and Spectroscopy		
11	1H NMR Overview: Chemical Shift, Integration, and Splitting; 1H NMR Problem Solving		13.5-8
12	H-NMR Interpretation and Problem Solving		13.5-8
13	Overlap, Symmetry, Integration, Splitting, Spectrum Prediction		13.5-8
14	More Problem Solving; Complex Splitting; Stereochemical Nonequivalence of Protons		13.9-10
15	13C NMR; Infrared Spectroscopy		13.12-14
16	Spectroscopy Catchup, Integrated Problems		catchup
	Additional Practice Sets/Videos: Jasperse NMR Problems (>40 pages) **Test 2 Practice Tests**: V1, V2, V3, V4		
	TEST 3 LECTURES. Carbonyls Chemistry; Enolates.		
17	Ketones/Aldehydes. Nomenclature, Properties, Intro.		18.1-7
18	Synthesis of Ketones/Aldehydes.		18.7-11
19	Reactions of Ketones/Aldehydes		18.13-20
20	Carbonyls, Carbohydrates, and Condensation Polymers		18.20-21
21	Catchup; Enols and Enolates Intro. Acid/Base Considerations; Proton as Electrophile		22.1-2, 22.15
22	Enols and Enolates Intro. Acid/Base Considerations; Proton as Electrophile		22.1-2, 22.15
23	Halogenation; Alkylation; Double Activation; Ester Hydrolysis; Decarboxylation		22.3, 5, 15-17
24	The Aldol Reaction (Aldehyde/Ketone as Electrophile)		22.7-11
25	Claisen Reaction (Ester as Electrophile)		22.12-17
26	Catchup		
27	The Wittig Reaction and Alkene Synthesis; Catchup		18.12
28	Catchup, Integrated Practice Problems.		Catchup
	Additional Practice Sets/Videos: Mechanism Practice (Many); Retrosynthesis Practice **Test 3 Practice Tests**: V1, V2, V3		
	TEST 4 LECTURES		
29	Amines. Intro, Nomenclature, Properties; Basicity of Amines; Structural Factors; Salts		19.1-7
30	Reactions of Amines. Proteins: Condensation Polymers of Amino Acids.		19.9-12, 16-17
31	Diazonium Chemistry; Amine Synthesis by Reductive Amination of Carbonyls		19.16-18
32	More Synthesis of Amines		19.18
33	Carboxylic Acids: Nomenclature; Properties; *ACIDITY*; Salts; Soap; SYNTHESIS		20.1-5
34	Acid Synthesis; Reactions		20.8-11
35	Reactions of Acids: Nucleophilic Acyl Substitution; Carboxylic Acid Derivatives		20.13-15; 21.1-3
36	Interconversions Among Acids and Derivatives; Synthesis and Mechanism; Catchup		21.5-7
37	Interconversions Among Acids and Derivatives; Synthesis and Mechanism; Catchup		21.5-7
38	Practice Problems		Practice
39	Polymers Chemistry. Addition, Condensation, and Biopolymers.		26.1-4, 24.8-10, 23.13
	Additional Practice Sets/Videos: Acid-Base Practice (Easy); Acid-Base Practice (Less Easy); Mechanisms, Retrosynthesis + Synthesis Design **Test 4 Practice Tests**: V1, V2, V3		
	Final Exam, Cumulative.		Final Exam

Testing Options: Via Zoom, Using a Proctor Local to You, or On-Site at MSUM

1. **Testing:** The nature of organic chemistry requires drawing/illustrating complex structures for chemicals and electron movements during reaction mechanisms. As such it is not conducive to multiple-choice or short-answer questions. Written tests can be taken either via Zoom, on-site at MSUM, or by using a proctor local to where you live.

2. **Flexible Test Scheduling:** There are **not** fixed tests dates. To some degree, you can make arrangements to take the tests (within limits) at your own schedule.
   - You could individualize your schedule. Gone for a long weekend for a family vacation or a wedding or national guard? Having surgery and missing a week? You could work ahead as needed to ensure the ability to master all of the material.

3. **Testing Options**

   a. **Proctored Testing via ZOOM:** You make arrangements with me; I send you the test; and I monitor you online via ZOOM. This is especially practical during COVID-19 restrictions or quarantine. You wouldn't need to leave your home.
      a. My Zoom-room link: https://minnstate.zoom.us/j/8827046226
      b. Email me to suggest a couple of time slots that could work for you, and I'll try to find one that can fit.
      c. Most weekdays other than Thursday will work.
      d. Sometimes by arrangement I'm willing to do testing on Saturdays at 9am central time, or on a weekday evening at 7pm.

   b. **Testing live at MSUM**: **Hagen 405/407J**.
      - I have a really nice conference room right next to my office.
      - Contact me regarding times that you might like.
      - I will always protect M/W/F at 1pm, but feel free to suggest/request other times that work well for you.

   c. **Live-Proctored Testing, local to you: You would make the arrangements. Arrange to have your tests proctored, typically at a local hospital, college, library, church or high school, etc., or with some other responsible individual.**
      a. For taking proctored tests, **YOU** will need to find/arrange the proctor; arrange scheduling with that proctor; email me the email, name, phone number, and job (or testing center or library or whatever) for your proctor; and email me a website for the organization that the proctor is a part of. (For example, if your church pastor is going to proctor your exam, I'd like to look him up to make sure he and the church really exist, before calling him to confirm! ☺)
      b. For proctored tests, I will email tests to the proctor who will print them. After a test is done the proctor will scan and email me the answers and destroy the printed copy.
      c. Prior to COVID, most colleges have proctoring services.
      d. Prior to COVID, many public libraries are willing to provide proctoring services

4. **Testing time is 90 minutes**.
   1) Tests are structured so that a well-prepared student should be able to complete a test in 50 minutes or less. But by allowing 90 minutes, that gives extra time to work on problems that you might get stuck on; it provides time to check your work; it provides more space for students who don't work fast; and it provides enough cushion so that you can just focus on your test without being distracted by worrying about the clock.
   2) If you do take proctored tests, you will want to arrange for a 90-minute time block.

5. **PROCTORED TESTS WILL NOT BE RETURNED**. Given the flexible test-scheduling, I will not be able to send you copies of your graded tests. Local students can see graded test in my office. This is one aspect of online organic that can't mirror regular class. But no practical way I can get around it. Sorry. ☹

How can I get off to a good start? Go through the following steps.

1. **Explore the website(s)**: https://collaborate.mnstate.edu/public/blogs/jasperse/online-organic-chemistry-courses/online-organic-chemistry-ii-360-fall-spring/
   - Find the links for each of the following, and in each case open and browse a little bit:
     a. Lecture Videos:
     b. Practice Tests:
     c. Syllabus:
     d. Textbook and Materials:
     e. Class Notes:
     f. Quizzes:
     g. Online Homework ("Achieve"):
     h. Test 1 (and 2 and 3 and 4) materials:
     i. General Information about how this online organic chemistry course will work
   - **Links for all of the above, and more, are available on the main website**

2. **Before the class begins**, you'll want to have done the following:
   a. Register for the class
      - For distance students or NDSU students (basically students who aren't already MSUM students): http://web.mnstate.edu/jasperse/Online/RegistrationDistanceStudents-Summer.pdf
      - Jasperse video explaining:
        - https://mediaspace.minnstate.edu/media/Online-Registration-OVerview/1_upct9ngb
   b. Order books (used textbook and solutions manual).
      - Amazon links: http://web.mnstate.edu/jasperse/Required-Text-and-Materials.pdf
   c. Sign up for Achieve Online Homework: https://achieve.macmillanlearning.com/start
   d. Print Syllabus: http://web.mnstate.edu/jasperse/Online/Syllabus360online-Summer.pdf
   e. Print Class Notes (double-side print, but best to do full-size):
      - http://web.mnstate.edu/jasperse/Online/Classbook-Chem360-online-summer.pdf
      - Buy a big 3-ring binder, and 3-hole punch notes so you can keep them all organized.
   f. Bookmark the main website:
      - https://collaborate.mnstate.edu/public/blogs/jasperse/online-organic-chemistry-courses/online-organic-chemistry-ii-360-fall-spring/
   g. View the video in which I talk through the syllabus and the course.
      - Access from main website, under "Organic Chemistry II - Test 1: Alcohol Chemistry…"
      - Maybe set the play speed at x1.5, or fast forward through parts!
   h. View Jasperse personal introduction video (with face showing! ☺):
      - https://mediaspace.minnstate.edu/media/350-online+Face-with-Voice-Personal-Intro/1_sasxj5r1

3. **Preparing for Test 1**
   a. Print To-Do Checklist for Test 1: http://web.mnstate.edu/jasperse/Online/Checklist-360Test1.pdf
   b. Review Skills/Competencies for Test 1: http://web.mnstate.edu/jasperse/Online/Objectives360-Test1.pdf
   c. Go through the lectures with the printed notes
      - https://collaborate.mnstate.edu/public/blogs/jasperse/online-organic-chemistry-courses/online-organic-chemistry-ii-360-fall-spring/
      - After each lecture, review the material
   d. Do lots of Practice/Homework Problems
      - Many sample practice problems integrated into the lectures
      - Required Achieve online homework
      - Practice sets. (Both main website and lectures website link to same sets.)
      - Recommended book homework problems as time permits
   e. Do the required quizzes (there is one for Test 1): http://web.mnstate.edu/jasperse/Online/Quizzes360Online.html
   f. Do the practice tests (there are four for Test 1)
      - http://web.mnstate.edu/jasperse/Chem360/Practice%20Tests/Chem360PracticeTests.html

g. Arrange proctored testing unless you can test at MSUM.

4. Basics of how the course will work:
   - The course will help you master the content through the use of recorded video lectures and detailed notes; through lots of different practice problems in varying formats; and through multiple practice tests that are similar to the real tests.
   - You will have scheduling flexibility in how fast you move and when you schedule your tests.
   - Tests can be taken via a proctor or at MSUM.
   - The grade will be 80-85% based on test performance, the rest on required homework and quizzes.

Dates, Flexible Schedules: Go-At-Your-Own-Pace "Asynchronous".

1. FLEXIBILITY. You can schedule your own test dates (so long as you finish all by May 11, 2022)

2. The "Official" semester start date is January 10, 2022
   - You can start earlier, much earlier, if you want

3. Semester Completion date: May 11, 2022.
   a. You can finish early, and you can start early (or late), but you MUST FINISH BY MAY 11
   b. MSUM academic calendar, for Spring and Spring classes: https://www.mnstate.edu/academiccalendars.aspx

4. YOU CAN START EARLY, AND/OR FINISH EARLY. (But must finish by May 11 deadline.)
   - I will try to have all course materials ready/online at least a month (usually many months) early
   - Since lectures and learning materials are online, you don't need to wait for the official university semester start dates to actually start. You could start sooner.

5. "GO AT YOUR OWN PACE"/ASYNCHRONOUS. Self-schedule your tests.
   - As long as you complete all of the tests by the end of the semester (May 11), test dates are otherwise unfixed/undefined. Some suggested planning schedules are shown on the following pages.
   - Online Homework assignments likewise have no fixed due dates, other than end-of-semester
   - For distance students testing with proctor, you can pretty much set up testing times with your proctor for whatever time fits your mutual schedules.
   - For those testing on-campus, you can schedule to take any test on any Monday, Tuesday, Wednesday or Friday that fits your schedule and your readiness. I will offer regular M/T/W/F testing at 9 am. Monday, Tuesday and Friday afternoons are also usually available, by arrangement.
   - You can adjust on the fly, to some degree. For example, suppose you were planning to take Test 1 on Monday, Jan 24, but you realized that if you could study more and take it on Tuesday or Wednesday or Friday, you could do much better. That would be OK. (Of course, it's all too easy to keep "moving tests back" only to run out of time, so be disciplined…)

6. For each individual test, plan to finish the regular lectures a week (or most of a week) prior to when you actually intend to test, so you have time to practice. Practice makes perfect!
   - Organic has LOTS of information. Tests will require that you know how to USE the info.
   - So, doing a lot of practice problems, practice sets, and practice tests is crucial for test preparation.

7. "IT'S EASY TO PROCRASTINATE AND FALL BEHIND. TRY TO SET UP AN AGGRESSIVE SCHEDULE FOR YOURSELF SO THAT YOU GET DONE EARLY. THAT WAY IF YOU DO HAVE SOME SETBACKS, YOU'LL HAVE SOME CUSHION TIME.
   - If you schedule to take the full 16 weeks, that will leave you no cushion in case job or other classes or personal issues create a scheduling crisis and leave you unable to prepare adequately.
   - If you schedule to finish early, that provides some "extra" weeks in case you need them. Or, if you finish Organic early, then it won't be competing for limited time late in the semester when you're perhaps cramming to finish papers, projects and final exams in other classes.

8. PROCTORED TESTS WILL NOT BE RETURNED. Given the flexible test-scheduling, I will not be able to send you copies of your graded tests. Sorry. ☹ But if you test on campus or via zoom, I will normally be able to grade the test right away and enable you to see where you lost points.

9. The following pages have some info to help with scheduling.

Some Suggested Possible Schedules: Test Scheduling Possibilities (Overview):

	Using 50-minute MSUM Kaltura Videos https://collaborate.mnstate.edu/public/blogs/jasperse/online-organic-chemistry-courses/online-organic-chemistry-i-350-fall-spring/
Test 1	Lectures 1-10 (under "Organic Chemistry I - Test 1…" pulldown)
Test 2	• Lectures 10b-21 (under "Organic Chemistry I - Test 2…" pulldown)
Test 3	• Lectures 22-29 (under "Organic Chemistry I - Test 3…" pulldown)
Test 4	• Lectures 30-39 (under "Organic Chemistry I - Test 4…" pulldown)

16-week: (see following pages for more detailed suggested schedule)

- Four weeks per typical test
- For typical test, Weeks 1-3: Go through all lecture videos, Achieve online homework, and some of the extra practice sets. For most tests, this will be about four lecture videos per week.
- Week 4: Study a lot; go through all the practice sets; complete any quizzes or incomplete Achieve; review lecture video discussion on topics that don't make sense; do all the practice tests. Then take the actual test.
- One week left to study for final and actually take the final
- Test 3 will take extra long; test 2 doesn't have nearly as many lectures and shouldn't take as long.
- Note: Test 2 is really a "half test" so should be completed more quickly

12-week: (see following pages for more detailed suggested schedule)

- Three weeks per typical test
- Weeks 1-2: Go through all lecture videos, Achieve online homework, and some of the extra practice sets. For most tests, this will be about five lecture videos per week.
- Week 3: Study a lot; go through all the practice sets; complete any quizzes or incomplete Achieve; review lecture video discussion on topics that don't make sense; do all the practice tests. Then take the actual test.
- This could leave variable time to study for the final.
- Why aim for 12-week schedule?
  - This could give time to finish early, so you could focus on other end-of-semester responsibilities.
  - This leaves cushion, in case one of the tests you struggle, or have other time-pressure crises.
  - This could finish before or immediately following Easter.
  - This could be helpful if you started late for whatever reason.
- Note: Test 2 is really a "half test" so should be completed more quickly

10-week: (see following pages for more detailed suggested schedule)

- Two-and-a-half weeks per test (17 days)
- Days 1-11: Go through all lecture videos, Achieve online homework, and extra practice sets.
- Days 12-16: Study a lot; go through all the practice sets; complete any quizzes or incomplete Achieve; review lecture video discussion on topics that don't make sense; do all the practice tests. Then take the actual test.
- Spend an 11th week studying for and then taking final.
- Why aim for 9-week schedule?
  - Just get it done really fast?
  - Maybe you started late for whatever reason?
  - During last summer, I had 160 students who completed course in 8 weeks or less (some in 6 weeks), so it's certainly possible.
- Note: Test 2 is really a "half test" so should be completed more quickly

8-week: (see following pages for more detailed suggested schedule)

- Two weeks per test
- 8 days : Go through all lecture videos, Achieve online homework, and some extra practice sets.
- Days 9-13: Study a lot; go through all the practice sets; complete any quizzes or incomplete or incomplete Achieve; review lecture video discussion on topics that don't make sense; do all the practice tests.
- Day 14: Take the actual test.
- Spend a 9th week studying for and then taking final.
- Note: Test 2 is really a "half test" so should be completed more quickly

Some Suggested Possible Schedules

Possible/Suggested 16-week Schedule (you can personalize it):

- **This approximates what students in a full-semester face-to-face class would do; 3-4 lectures per week.**

	Using 50-minute MSUM Kaltura Videos https://collaborate.mnstate.edu/public/blogs/jasperse/online-organic-chemistry-courses/online-organic-chemistry-i-350-fall-spring/
Test 1 Mon 2/7	• Lectures 1-10 • Finish lectures/Achieve by Monday, 1/31 • Digest/Practice/Integrate Tuesday-till-test
Test 2 Mon 3/7	• Lectures 11-16 (short, fewer, limited content) • Finish lectures/Achieve by Monday, 2/28 • Digest/Practice/Integrate Tuesday-till-test
Test 3 Mon 4/11	• Lectures 17-28 (longer, harder; much content) • Finish lectures/Achieve by Monday, 4/4 • Digest/Practice/Integrate Tuesday-till-test
Test 4 Mon 5/2	• Lectures 29-39 • Finish lectures/Achieve by Monday, 4/25 • Digest/Practice/Integrate Tuesday-till-test
Final Mon 5/9	• Study like crazy for a week! It's hard.

Notes on the 16-week schedule:

- On this schedule you should routinely be going through test lectures in three weeks (~4 lectures per week), then giving yourself most of a week to catch up, study, review, do lots of practice problems, practice sets, and practice tests prior to actually taking the tests.
- Test 2 is a "half-test" in point value, and involves only 6 lectures, so should be handled much faster.
- Test 3 is especially challenging, so might demand some extra time.
- You could move faster if you wished.
- A week is included between test 4 and the cumulative final.
- The final must be completed by May 11th.
- These dates assume you want to match with the regular class schedule. But, probably you don't.
    - You'd do well to finish sooner.
    - That way, if you're taking other classes that have end-of-semester requirements and final exams, your time for this class wouldn't be competing with your time for those.
    - Many of you may wish to start way early, well before January 10.
    - Wouldn't it be nice to complete before Easter? Or, perhaps before the end of April? Maybe even by the end of Spring Break week? ☺☺☺

Schedule Flexibility and the Possibility of Customizing Your Schedule to Your Own Circumstances:

- As long as you complete all of the tests by the end of the semester (May 11), test dates are otherwise unfixed/undefined.
- You could start way early (including as early as November!) and finish way early as well (including as early as February or March) if you wish.
- For those testing on-campus, you can schedule to take any test on any Monday, Tuesday, Wednesday or Friday that fits your schedule and your readiness. I will offer regular Monday/Tueday/Wednesday/Friday testing at 9am, and will be able to test at many other times upon request and arrangement.
    - You can make case-by-case arrangements with me to test on other days/times.
- For distance students testing with proctor, you can pretty much set up testing times with your proctor for whatever time or day fits your mutual schedules. In my listed schedules, I'm usually listing Mondays or Fridays. But if you are testing using a proctor, you can arrange any day of the week that works for you and proctor.
- You can adjust on the fly, to some degree. For example, suppose you were planning to take Test 1 on Friday, Feb 4, but you realized that if you could study for a couple more days and take it on Monday or Tuesday, you could do much better. That would be OK. (Of course, it's all too easy to keep "moving tests back" only to run out of time, so be disciplined…)

Possible/Suggested 12-week Schedule (you can personalize it):

- **This should involve about 5 lectures per week.**

	Using 50-minute MSUM Kaltura Videos https://collaborate.mnstate.edu/public/blogs/jasperse/online-organic-chemistry-courses/online-organic-chemistry-ii-360-fall-spring/
Test 1 Mon 1/31	• Lectures 1-10 • Finish lectures/Achieve by Monday, 1/24 • Digest/Practice/Integrate Tuesday-till-test
Test 2 Mon 2/14	• Lectures 11-16 (short, fewer, limited content) • Finish lectures/Achieve by Monday, 2/7 • Digest/Practice/Integrate Tuesday-till-test
Test 3 Mon 3/14	• Lectures 17-28 (longer, harder; much content) • Finish lectures/Achieve by Monday, 3/7 • Digest/Practice/Integrate Tuesday-till-test
Test 4 Mon 4/4	• Lectures 29-39 • Finish lectures/Achieve by Monday, 3/28 • Digest/Practice/Integrate Tuesday-till-test
Final Mon 4/11	• Study like crazy for a week! It's hard.

Possible/Suggested 10-week Schedule (you can personalize it):

	Using 50-minute MSUM Kaltura Videos https://collaborate.mnstate.edu/public/blogs/jasperse/online-organic-chemistry-courses/online-organic-chemistry-ii-360-fall-spring/
Test 1 Fri 1/28	• Lectures 1-10 • Finish lectures/Achieve by Monday, 1/24 • Digest/Practice/Integrate Tuesday-till-test
Test 2 Fri 2/11	• Lectures 11-16 (short, fewer, limited content) • Finish lectures/Achieve by Monday, 2/7 • Digest/Practice/Integrate Tuesday-till-test
Test 3 Fri 3/4	• Lectures 17-28 (longer, harder; much content) • Finish lectures/Achieve by Monday, 2/28 • Digest/Practice/Integrate Tuesday-till-test
Test 4 Fri 3/25	• Lectures 29-39 • Finish lectures/Achieve by Monday, 3/21 • Digest/Practice/Integrate Tuesday-till-test
Final Fri 4/1	• Study like crazy for a week! It's hard.

Possible/Suggested 8-week Schedule (you can personalize it):

- **This should involve an average of at least one video lecture per day, weekends included.**

	Using 50-minute MSUM Kaltura Videos https://collaborate.mnstate.edu/public/blogs/jasperse/online-organic-chemistry-courses/online-organic-chemistry-ii-360-fall-spring/
Test 1 Mon 1/24	• Lectures 1-10 • Finish lectures/Achieve by Thursday, 1/20 • Digest/Practice/Integrate Thursday-till-test
Test 2 Mon 2/7	• Lectures 11-16 (short, fewer, limited content) • Finish lectures/Achieve by Thursday, 2/3 • Digest/Practice/Integrate Thursday-till-test
Test 3 Mon 2/28	• Lectures 17-28 (longer, harder; much content) • Finish lectures/Achieve by Thursday, 2/24 • Digest/Practice/Integrate Thursday-till-test
Test 4 Mon 3/14	• Lectures 29-39 • Finish lectures/Achieve by Thursday, 3/10 • Digest/Practice/Integrate Thursday-till-test
Final Mon 3/21	• Study like crazy for a week! It's hard.

Copy of "Full" Schedule Used by Regular "Face-to-Face" Class

		Chemistry 360, Jasperse, Spring 2022 Wade 7 (43 class days, 39 lectures)		Reading
	Date	Topic		Assignment
1	10-Jan	Intro; Structure, Nomenclature, Properties, Weak Acidity of Alcohols		10.1-10.6
2	12-Jan	Synthesis of Alcohols; Organometallic Reactions.		10.7-10.9
3	14-Jan	Synthesis of Alcohols; Organometallic Reactions.		10.7-10.9
		Skip 10.12		
	17-Jan	No Class. Martin Luther King Day.		no class
4	19-Jan	Side Reactions; Reduction of Carbonyl Compounds		10.10-10.11
5	21-Jan	Oxidation of Alcohols		11.1-11.3
		Skip 11.4, 11.11-13		
6	24-Jan	Conversion of Alcohols to Tosylates or Halides; Uses of Tosylates and Halides		11.5-11.9
7	26-Jan	Miscellaneous; Chemical Tests; Multistep Synthesis		11.10, 11.14
8	28-Jan	Retrosynthetic Analysis		
9	31-Jan	Catchup, Multistep Synthesis Problems		Catchup
10	2-Feb	Review for Test 1		---
11	4-Feb	1H NMR Overview: Chemical Shift, Integration, and Splitting; 1H NMR Problem Solving		13.5-8
12	7-Feb	1H NMR Overview: Chemical Shift, Integration, and Splitting; 1H NMR Problem Solving		13.5-8
T1	9-Feb	**Test #1 Covering Chapters 10-11.**		**Test 1**
13	11-Feb	1H NMR Problem Solving		13.5-8
14	14-Feb	More Problem Solving; Complex Splitting; Stereochemical Nonequivalence of Protons		13.9-10
15	16-Feb	13C NMR; Infrared Spectroscopy		13.12-13; 12.11-12
16	18-Feb	Spectroscopy Catchup, Integrated Problems		catchup
		(Focus on 13.5-8, 12-13; Skim 13.1-4, 9, 10; Skip 11, 14)		
17	21-Feb	Ketones/Aldehydes. Nomenclature, Properties, Intro.		18.1-7
T1	23-Feb	**Test #2 Covering Chapters 12-13. 50 points.**		Test 2
18	25-Feb	Synthesis of Ketones/Aldehydes.		18.7-11
19	28-Feb	Reactions of Ketones/Aldehydes		18.12, 14-17, 18-19
20	2-Mar	Reactions of Ketones/Aldehydes		18.20-21
21	4-Mar	Catchup; Enols and Enolates Intro. Acid/Base Considerations; Proton as Electrophile		22.1-2, 22.15
		(Skip 18.13, for now….)		
22	7-Mar	Enols and Enolates Intro. Acid/Base Considerations; Proton as Electrophile		22.1-2, 22.15
23	9-Mar	Halogenation; Alkylation; Double Activation; Ester Hydrolysis; Decarboxylation		22.3, 5, 15-17
24	11-Mar	The Aldol Reaction (Aldehyde/Ketone as Electrophile)		22.7-11
		(Skip 22.4,6. 18, 19)		
	14-Mar	No Class, Spring Break		
	16-Mar	No Class, Spring Break		
	18-Mar	No Class, Spring Break		
25	21-Mar	Claisen Reaction (Ester as Electrophile)		22.12-17
26	23-Mar	Catchup		
27	25-Mar	The Wittig Reaction and Alkene Synthesis; Catchup		18.13
28	28-Mar	Catchup, Integrated Practice Problems.		Catchup
29	30-Mar	Amines. Intro, Nomenclature, Properties; Basicity of Amines; Structural Factors; Salts		19.1-7
30	1-Apr	Reactions of Amines		19.10-13, 17-18
T3	4-Apr	**Test #3 Covering Chapters 18 and 22.**		
31	6-Apr	Diazonium Chemistry; Amine Synthesis by Reductive Amination of Carbonyls		19.17-19
32	8-Apr	More Synthesis of Amines		19.19
33	11-Apr	Carboxylic Acids: Nomenclature; Properties; *ACIDITY*; Salts; Soap; SYNTHESIS		20.1-5
34	13-Apr	Acid Synthesis; Reactions		20.8-11
	15-Apr	No Class, Easter Friday		
		(Skip 19.8-9,14-16,24-25)		
	18-Apr	No Class, Easter Monday		
35	20-Apr	Reactions of Acids: Nucleophilic Acyl Substitution; Carboxylic Acid Derivatives		20.13-15; 21.1-3
36	22-Apr	Interconversions Among Acids and Derivatives; Synthesis and Mechanism; Catchup		21.5-7
		(Skip 20.6,7,12; Skip 21.4))		
37	25-Apr	Interconversions Among Acids and Derivatives; Synthesis and Mechanism; Catchup		21.5-7
38	27-Apr	Practice Problems		-
39	29-Apr	Catchup		
T4	2-May	**Test #4 Chapters 19-21**		Test 4
1	**11-May**	**Final Exam, 11:30am., Wednesday**		**Final Exam**

*Note: On this schedule some lectures for a later test (for example Test 3) come before an earlier test (for example Test 1) has been completed.

On-Line Lectures: https://collaborate.mnstate.edu/public/blogs/jasperse/online-organic-chemistry-courses/online-organic-chemistry-ii-360-fall-spring/ or http://web.mnstate.edu/jasperse/Online/Lectures360online.html (classic)

1. These are normally recorded "Kaltura" lectures from earlier semester's face-to-face class. You will see and hear exactly what a student would see in a regular face-to-face class.
2. Because the video lectures were actually recorded previously, they often mention Sapling due dates, test days, or days of the week that won't make any sense to you. Beware of those!
3. While there are additional study materials and videos, the main lecture videos are normally 50-minutes in length.
4. There are ~37 such lectures.
5. "Watching" videos is one thing; understanding everything enough to do everything is quite another! Getting a good grade in organic chemistry is definitely not a spectator sport!
6. **Normally you'll have wanted to work through all the lectures up to a week before taking a test, so that you've got time to practice, review, integrate, and synthesize all the information, and so that you've got time to work through the practice sets and practice tests, etc**..
7. There are several display options, including full screen.
8. Lectures will default to showing captioning; you can turn that off if you prefer
9. There are also play-speed options. If I'm lecturing too slowly, you can speed it up.
10. The ability to pause and rewind is really helpful for difficult topics.
11. **Kaltura videos can be downloaded to your computer as mp4 files so that you can view without streaming.**
    - If you don't have consistent fast internet, you may wish to download a whole bunch of videos as mp4 files while you do have access to fast internet. Then if you're on an airplane, or on the bus for an athletics trip, or visiting grandparents, etc., you'll still be able to view the videos! ☺
    - A "download" command will appear below the video display ***if*** you are logged into D2L or media space.
    - To download, you must be logged into Minnesota State Media Space using your StarID.
        a. Easy way: With a class Kaltura video open, (NOT in full-screen mode), the right-hand corner will say "guest" or show a login icon (or your name if already logged in). Click, then enter StarID and password to login. Once logged into Media Space, then when you open a video the "download" button will appear below the video display screen.
            - Once logged into Media Space, you'll stay logged in for a while. So, if you're trying to download 20 videos, for example, you could log in once, then download all 20 of them...
        b. Or you could sign into D2L using StarID: https://mnstate.learn.minnstate.edu/
        c. Here's a video showing the process: https://mediaspace.minnstate.edu/media/How+to+Download+Kaltura+Videos/1_b366psck

Do you have the Technical Capacity to play the online videos effectively? And Downloading so you don't need to have streaming internet.

- These are pretty standard videos. So, if you have internet access, you should be fine.
- Kaltura test (this is just a standard video):
    - https://mediaspace.minnstate.edu/media/360-AL05-Alcohol-to-Alkoxide-Ether/1_6le0fu0n
- To be able to download as mp4 files, see note above.
- While Kaltura doesn't have a specific "diagnostics" page, there is a nice "Tegrity" diagnostic page.
    - https://athens.tegrity.com/#/diagnostic
    - Tegrity is a different video-server than Kaltura. But usually if your device satisfies all or most of the the Tegrity diagnostics check boxes, it will also be suitable for Kaltura videos.

2. For additional syllabus information regarding technical capacity expectations and technical support, see **Technical Skills** and **Technical Support** sections later in syllabus.

Which Videos go with Which Tests? And why you need to finish the Videos Well before taking the test:

- You need to get through all the lectures but then also have time to put everything together.
  - If you're doing the last lecture the night before taking a test, you'll not succeed on tests!
  - You need time to put it all together: review and study everything; practice everything; finish your required Achieve homework; do more book practice; and do the practice tests!
- **You'll want to have finished going through all the lectures most of a week before taking a test so you've got time to actually master everything and become test-success ready.**
- **Many additional practice sets and videos are linked from the lectures web page**

	Using 50-minute MSUM Panopto Videos https://collaborate.mnstate.edu/public/blogs/jasperse/online-organic-chemistry-courses/online-organic-chemistry-ii-360-fall-spring/
Test 1	• Lectures 1-10 (under "Organic Chemistry II - Test 1..." pulldown)
Test 2	• Lectures 11-16 (under "Organic Chemistry II - Test 2…" pulldown)
Test 3	• Lectures 17-28 (under "Organic Chemistry II- Test 3…" pulldown)
Test 4	• Lectures 29-39 (under "Organic Chemistry II - Test 4…" pulldown)

In-Class Notes: http://web.mnstate.edu/jasperse/Online/Classbook-Chem360-online.pdf
I have a very thorough set of notes that can be used in class. Included will be numerous examples and practice problems that I/we will work in lecture together. You should print the notes (print on both sides of a page), 3-hold punch them, and keep them organized in a 3-ring binder. Many students actually print two copies, one to work through with me during lecture, the other set for working out on their own after lecture.

Practice tests, Answers, and Videos: http://web.mnstate.edu/jasperse/Chem360/Practice%20Tests/Chem360PracticeTests.html

- All practice tests in a single document: http://web.mnstate.edu/jasperse/Online/PracticeTests-All-Chem360.pdf
- All practice-test answer keys in a single document:
  - http://web.mnstate.edu/jasperse/Online/PracticeTests-Answers-All-Chem360.pdf

1. There are three or four practice tests available for each test which can be printed from the website.
2. These are normally exact copies or slightly edited versions of actual past tests. As such they are invaluable for getting an idea of what my tests look like, for evaluating whether you are or aren't well prepared, and for recognizing study areas that need additional attention.
3. For each test, there is also an answer key, and a video in which I discuss each problem.
4. For each test, there is also a "test preview" in which I discuss the format, length, and distribution.

Extra Practice Problems and Practice Sets: Available from main website, or from single-document links below:

- All practice sets in a single document: http://web.mnstate.edu/jasperse/Online/Practice-Sets-All-Organic-Chemistry-2.pdf
- All practice-set answer keys in a single document:
  - http://web.mnstate.edu/jasperse/Online/Practice-Sets-Answers-All-Organic-Chemistry-2.pdf
- Between Achieve homework, assigned/recommended book problems, and practice tests, there are usually a good variety and volume of problems to assess your understanding and to practice and sharpen your skills.

1. However, for each test I have also created a series of additional practice sets to address important learning skills. Sometimes these are topics where I know students tend to struggle, or where the Achieve/book problems aren't perhaps as representative of test problems as I'd like.
2. For each of these extra practice sets, you can print them from the website; there are answers provided; and in each case I have a video created to talk through each problem.
3. Having the video explanation/discussion is helpful for many students in trying to understand the process for solving problems. Obviously the book problems and Achieve problems don't have the same kind of commentary available.

Achieve On-Line Homework: https://achieve.macmillanlearning.com/start
More details on a later page. Achieve's modules enable one to interact with 3D models and draw chemical structures. You get instant grading, sometimes response-specific coaching, and detailed answer explanations. The Achieve homework also provides an effort-driven opportunity to earn some points! (Achieve averages are typically much higher than test averages.)

ACHIEVE/SAPLING OnLine Homework, version 2022

- ACHIEVE/Sapling should be ready at least by November 15, and can be sooner by arrangement.

Getting on when you've already enrolled: (see lower down for enrolling at first)

1. Website: https://achieve.macmillanlearning.com/
2. Sign in
3. Have "VIEWING BY" set as "Assignments"
4. Miscellaneous:
   - You can try a problem as many times as you like. But the scoring will cost you only 5% of the points available (per problem) for each incorrect attempt.
   - **Jasperse can enter due-date extensions.**
   - Take some time with the introduction materials, including the "training assignment" and the "drawing tips and shortcuts" practice problems.
   - You do not need to complete a chapter assignment at a single time. You can do as much as you like; leave; and return as you like.
   - ACHIEVE scores will not appear in your D2L grade records until after you've completed all of the assigned ACHIEVE work.
   - For course points, your ACHIEVE points will equal ACHIEVE % x 80.
     - So, for example, 100% x 80 = 80/80; 90% x 80 = 72/80, etc..

How to enroll into the ACHIEVE/Sapling online homework problems required for this course:

Short Synopsis:

1. Go to: https://achieve.macmillanlearning.com/
2. Click on **"I Need to Enroll in a Course"**
3. Enter your course ID as given to you by your instructor (see website, syllabus, email, or request)
   a. Course ID for Spring 2022: tcjs9s
4. You then have two options:
   a. Purchase Access Online: Select the access period you want to buy. Add it to your cart. Create an account. Follow the check-out process.
   b. Already have a code: Simply enter in the code you have either purchased or received. Create an account and you're in.

Longer with More Step-by-Step Details:

1. Go to: https://achieve.macmillanlearning.com/
2. Click on **"I Need to Enroll in a Course" (**in the lower left quadrant)
3. Enter the Course ID (this is specific/unique to each course).
   a. Course ID for Spring 2022: tcjs9s
4. Click "Purchase Achieve Access" button
   - This is the most direct, cheapest payment and the way to go.
     - The "enter access code" would apply if you purchased access from the bookstore. Hopefully the bookstore will have access code cards, but I'm not totally sure?
5. Add it to your cart.
   - If first time using "Achieve", you may need to fill in account information, with email and password and stuff at this point? Or maybe that will happen later….
   - Note: *IF* it's Organic I you are adding, there will be an option to buy two-semesters worth of access at a reduced cost.
   - If it's O2 you are adding and you'd previously paid for 2-semesters access, you'll get a prompt that you can use that previous payment.
6. Checkout.
7. Create Account or Sign In
8. Achieve Technical Support:
   - https://macmillan.force.com/macmillanlearning/s/chat-with-us

Study Strategy: Putting off the extensive information in organic chemistry will only make it harder on you. After each lecture, try to study the day's notes and work all of the assigned book problems. Some practical study thoughts:

1. General university policy is that an average student in an average class should study for at least two hours out of class for one hours in class to get an average grade.
   - Fact: Organic chemistry isn't really an average class! And do you want an average grade?
2. I suggest reviewing the class notes and in-lecture practice problems ASAP after a lecture, and going through the material at least twice.
3. Many students print an extra copy of class notes, and try to redo all the in-lecture problems on their own.
4. I suggest working Achieve/book problems associated with the sections covered in class right after that.
5. Reading the book: the textbook is a support resource. If you didn't understand some of the material in class, the book will frequently have a more complete and detailed discussion that will help you understand things.
6. If I decide I'm not going to take the time to study the class notes, to do Achieve and book problems, and to read the book, which one should I sacrifice first? Possibly some book reading? If you read but run out of time before you get to practice and understand the problems, it's not a recipe for success.
7. The practice tests are excellent rehearsal for the real tests. Do them all!
   - http://web.mnstate.edu/jasperse/Chem360/Practice%20Tests/Chem360PracticeTests.html
   - All practice tests in a single document:
     - http://web.mnstate.edu/jasperse/Online/PracticeTests-All-Chem360.pdf
   - All practice-test answer keys in a single document:
     - http://web.mnstate.edu/jasperse/Online/PracticeTests-Answers-All-Chem360.pdf
8. Do absolutely all of the practice sets, which are excellent rehearsal for the real tests.
   - Available from main website, or from single-document links below:
   - Practice sets in a single document: http://web.mnstate.edu/jasperse/Online/Practice-Sets-All-Organic-Chemistry-2.pdf
   - Practice-set answer keys in a single document:
     - http://web.mnstate.edu/jasperse/Online/Practice-Sets-Answers-All-Organic-Chemistry-2.pdf

Class E-Mail List: An email list will be sent to all registered students before the class officially begins.

- **The list may use your MSUM address, so if you haven't received an email from me, send me an email with the actual address you'd like me to use!**

Book Homework Problems: (see list on following page).

- All assigned/recommended book problems represent what I consider to be reasonable test-level problems. I have gone through each problem in the book and selected out those I think are the most representative and practical.
- There may be a few that are trickier than I'd put on a real test, but the majority are ones you ought to be able to do.
- All have worked-out answers in the Solutions Manual. **The homework is a great way to practice problem solving, assess your progress, and prepare for tests.** Since solutions are available, I will not collect the book homework.
- **The few "quiz" assignment problems that I require and grade are no substitute for doing book homework problems! Likewise the on-line Achieve homework will not be sufficient**.

MSUM Sexual Violence Policy: Acts of sexual violence are intolerable. MSUM expects all members of the campus community to act in a manner that does not infringe on the rights of others. We are committed to eliminating all acts of sexual violence.

MSUM faculty and staff are concerned about the well-being and development of our students. We are obligated to share information with the MSUM Title IX Coordinator in certain situations to help ensure that the students' safety and welfare is being addressed, consistent with the requirements of the law. These disclosures include but are not limited to reports of sexual assault, relationship violence, and stalking.

If you have experienced or know someone who has experienced sexual violence, services and resources are available. You may also choose to file a report. For further information, contact Lynn Peterson, Coordinator of Sexual Assault Services at Hendrix Clinic and Counseling Center, 218-477-2211, or Ashley Atteberry, Title IX Coordinator in Owens Hall 208 (218-477-2174; ashley.atteberry@mnstate.edu). Additional information is available at: www.mnstate.edu/titleix

ORGANIC CHEMISTRY II PROBLEMS, USING WADE 8

Amazon link, for Used Textbooks and Solutions Manuals (Cheap)

- Organic Chemistry (8th Edition) by L. G. Wade Jr

https://www.amazon.com/s/ref=nb_sb_ss_i_3_18?url=search-alias%3Dstripbooks&field-keywords=wade+organic+chemistry+8th+edition&sprefix=Wade+Organic+Chemi%2Cstripbooks%2C167&crid=EQRKPH7VPDSN

- If you are using a different textbook, for example Wade 7th or 6th edition, or Carey 10th or 9th of 8th edition, see the following link to see which problems are appropriate from those books. If you don't have one of the books on this list, then I don't have a list of problems from your book that are appropriate.

http://web.mnstate.edu/jasperse/Chem360/Other%20Books-Problems%20and%20Readings%20342/Other%20Books-Problems%20and%20Readings.htm

Chapter Topic	Wade Chap	Wade 8 Problems In the Chapter	Wade 8 Problems Back of the Chapter
Structure and Synthesis of Alcohols	**10**	1, 5d, 6, 8, 10, 12a,b,d, 13-16, 17 (esters only), 18-20, 22-26	31, 33a-d, 34b,c, 35a,c, 36b,c, 37 (review from chapter 8), 38a-l, 39, 40, 42, 43
Reactions of Alcohols	**11**	1a,b,d, 2, 3, 4.1,2, 5a,b, 6, 9, 10, 11, 12a, 13, 14, 22, 23, 26a, 33, 34, 35, 36, 37, 38	40 (do the bromides only), 41 (skip g), 42, 43, 44, 48a, b, c, f, g, h, 49, 50, 52, 53, 56
Nuclear Magnetic Resonance Spectroscopy	**13**	2, 3, 4, 5, 6, 7, 9, 11, 13a, 15, 16, 18, 22, 24a-e, 25, 27, 29, 30, 32	33, 34, 35 (skip d), 36, 38, 39, 40, 41, 43, 44, 49
Infrared Spectroscopy	**12**	4, 5	16
Ketones and Aldehydes	**18**	1a,b, 6, 7, 8, 9, 11, 17a, 18, 20a, 21, 23, 24, 25, 26a,b,d, 27, 28, 29, 30, 31, 32, 33a-d, 34a-c, 36a	38a-c, e-g, l, 39a,e, 40, 41, 43, 44, 47a,c,d, 49, 50a,b,d,e, 51a-f,h, 52, 53a-g, i-l, 54a-e, 55a,c,d,e,f 57, 58, 59, 64a-d, 65
Alpha Substitutions and Condensations of Enols and Enolate	**22**	(Enols, Halogenation) 1, 2, 3, 5, 10, 11, 12, 13, 14, (Aldol) 18, 19, 22, 23, 24, 25, 26, 27, 28, 29, 30,32, (Claisen) 34a, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, (alkylation-decarboxylation) 46, 47, 49, 50, Ch 18.15, 16 (Wittig)	60, 61, 62, 63, 64, 65, 66 (Basically draw the dicarbonyl precursor), 67, 68 (skip c,g), 69a, d, e, 70, 71, 73a-c
Amines	**19**	1,2(skip b,d), 3a-c, 5b,c, 6a-c, 15, 16, 17, 26, 27, 28, 30a-c, e-g, 31	32a-e, 33, 35a,c,d 36a, h,i, j,l,m ($NaBH(OAc)_3$ = NaBH3CN), p, q, 37f, 39a,d,g, 42
Carboxylic Acids	**20**	1b-d,g, 2a-c, 3, 4, 5, 6, 11 b,c,d,f, 12, 13, 15b,c, 16a,b, 18, 19, 20, 21, 23, 24	25 (not d,g, i), 26a,b,c,f,g, (IUPAC only), 27a,e,f,h,I, 28, 29 (skip b), 30a,d,e, 31, 32a,c,d, 33, 35a-e,i,j,k, 36a-c,e,f, 37, 38, 39, 41, 42, 44, 47
Carboxylic Acid Derivatives	**21**	1a-c, 6-14,16, 18, 31, 32a,b	42a-c, 43a,c,d,e,f, 44, 45a,e,f, 46, 47 (saponification is NaOH/H2O hydrolysis), 48a,b, 49a,b,d, e, 50a,b,c,e,f,g,h, j, l, 54a,c,d,f,j, 55, 57a-c

Getting Help, Office Hours, Course Communications:

1. Live Face-to-face office hours:
   - M, W, F 9-10:30, 1:00-2:00. T: 10-11:30, 1:00-2:00. H: 1:00-4:00
   - But try any times NOT in blue on my schedule: http://web.mnstate.edu/jasperse/Online/NormalSchedule.pdf
   - MSUM office: Hagen 407J. Phone 218.477.2230

2. Instructor Help Options
   a. Phone! Often works very well.
   b. Email: I check often, including nights and Saturdays
      - Many students use screen shots, whether for an Achieve homework question, or something in the notes or a practice test or something. This makes it easy to show what you're having trouble with, and makes it easy for me to focus my answer.
   c. Achieve: If you email screen shots of problems or "why-is-this-answer-marked-wrong", I can sometimes explain why they're wrong and what you should have done instead
   d. Online office hours: 9:30-12:00.

Classroom Response Plan

1. Quizzes or tests will normally be graded with scores posted by end of the next Tuesday or Friday.
2. Emails will *normally* be answered within 48 hours on M-F ("work days"). I will try and will often respond variably faster than 24 hours.
3. Emails coming in after 10pm will rarely be answered until the following day.
4. I often process class emails on Saturdays as well as M-F, but not on Sundays.
5. If you include a screen shot of the problem or question you have in mind, response will be faster! :)
6. Information about proposed proctor should be sent to me at least 3 workdays prior to the first test with that proctor to ensure that the test(s) can be sent in time.

Minnesota State University Moorhead is accredited by the Higher Learning Commission and is a member of the North Central Association of Colleges and Schools. https://www.mnstate.edu/about/accreditation.aspx

American Chemical Society certified: Minnesota State University Moorhead's Chemistry BS degree is certified by the American Chemical Society

- May be helpful information for national students from non-MSUM schools.
- If your advisor or records office wonders if Organic Chemistry at MSUM is legit, they might ask if it's ACS-certified.

Academic Honesty

The University expects all students to represent themselves in an honest fashion. When an instructor has convincing evidence of cheating or plagiarism, a failing grade may be assigned for the course in which the student cheated. Instructors also may choose to report the offense. A student who has a course grade reduced by an instructor because of cheating or plagiarism, and who disputes the instructor's finding, may appeal the grade, but only by using the Grade Appeal Policy. For a full description of the MSUM Code of Academic Honesty, see: http://www.mnstate.edu/student-handbook/policies-procedures.aspx

University Policies: As a student of MSUM, you are expected to be familiar with all University policies. These can be found in the Polices & Procedures section of the Student Handbook.

- https://www.mnstate.edu/student-handbook/policies-procedures.aspx

For Some Other Questions or Issues About how this Online Organic Chemistry Course will Work, see the following Website:

- http://web.mnstate.edu/jasperse/Online/OnlineOrganicGeneral.htm
- The website addresses some common questions students have asked me about the course.

I usually provide some notes, and video in which I talk through some thoughts about each topic.

Getting Registered for MSUM and for the Course, for non-MSUM Students:

- Note: This includes NDSU students.

1. **APPLY TO MSUM as a "Non-degree seeking student"**: https://www.mnstate.edu/admissions/non-degree/
https://eservices.minnstate.edu/adm/public/studentWelcome?campusId=072&appType=undergrad&_ga=2.206061393.33361417.1599496993-2046871640.1599278883
   a. Online: Click the "Apply Online" button (from above link).
      - **Create StarID first, and a password. Record these so you can access later! ☺ (You'll need them!)**
      - Don't bother to fill in several pages about HS background etc.
      - **Be sure to mark "Complete courses and transfer without a degree" and "Part Time Student" buttons**
      - On page where it says "Major-Academic Program", don't enter anything
      - Please do **NOT** click promo code towards the end, if you see something like that.
      - $20 fee at the end; should be box that says "Pay Now"; click on that and be able to submit payment
      - If prompted for an immunization report: immunization records are NOT required for admission to be completed, or for your first semester enrolled at MSUM. (But for a second term, they will be required.)
   b. You will not need to send official transcripts from your school for MSUM application.
   c. Approval normally 1-7 days, but may be expedited. You will be notified by both email and snail-mail.
   d. Deadlines:
      - MSUM application by January 6 is preferred, but not essential; later applications through Jan 15 will also work, and there are late-application workarounds possible after that.
      - For later application, a contact person who may be able to expedite admission is Audrey Cloe Messner in admissions. (Email: audrey.cloe@mnstate.edu; office 218.477.2559; cell 218.304.7676).
      - Both admission AND class registration should be completed by Jan 15 (barring late-registration workaround)
        1. To request late-admission/registration workaround after Jan 15, contact **both** Audrey Cloe Messner in admissions (Email: audrey.cloe@mnstate.edu; office 218.477.2559; cell 218.304.7676) and me, Dr. Jasperse (Email: jasperse@mnstate.edu. Phone 218.477.2230)
        2. Or see: http://web.mnstate.edu/jasperse/Online/Late-Application-Registration-Instructions.pdf
      - If you don't get ≥$300 payment in by start of semester, you'll get dropped from class roster.

2. **REGISTER FOR THE COURSE(S):** http://www.mnstate.edu/eservices/
   a. You'll need your StarId and password to login.
   b. Admission into MSUM must be completed before you can register.
   c. Registration for spring classes opens on October 29, 2021, at 1pm
   d. Pay First: After registering, pay ≥$300 by start of semester, or you'll get dropped from class roster.
   e. Pay Rest: If you don't complete your payments , your grade will never be released! (Plus a late-payment fee.)
   f. Can pay online (https://www.mnstate.edu/eservices/), or use debit/credit card on phone to business office: 218.477.2242. (For special late-enrollment registration, you'll need to call business office to pay ≥$300 down.)
   g. Payment reminders are emailed to your MSUM email, which you may not check? So remember to pay!

3. **Tuition+Fees: Varies by State. (Numbers listed are for Fall 2021, but may inflate Fall 2022 …).**
   - ~$1064.37: Minnesota, SD, ND, and WI (reciprocity states). [Note: cheaper than NDSU! ☺]
   - ~$1591.32 IL, IN, KS, MI, MO, NEB (Midwest Consortium states)
   - ~$1918.26 Other states
   - Reciprocity agreements: https://www.mnstate.edu/registrar/residency-reciprocity.aspx

4. **For NDSU Students: Does Tricollege work?**
   a. Direct enrollment (to MSUM, see above) always works.
   b. For Summer 2022, tricollege enrollment will not be possible; but direct enrollment via MSUM will work.

(Craig: Price Link: https://www.mnstate.edu/cost-aid/undergraduate/)

Academic and Student Support Services: The Academic Support Center has resources to assist you with Advising, Registration, Academic Support and Tutoring, and Academic Enhancement.

1. Visit their website for a list of Services or call 218.477.4318.
   - http://www.mnstate.edu/asc/
2. Some online Tutoring is available to assist students.
   - http://www.mnstate.edu/asc/onlinetutoring.aspx
3. The Student Handbook is a valuable reference available to you.
   - http://www.mnstate.edu/student-handbook/
4. eServices provides online registration and account management.
   - http://www.mnstate.edu/eservices/
5. Library Distance Ed Services are available to you as you research and study.
   - http://libguides.mnstate.edu/content.php?pid=448709
6. The Disability Resource Center provides services to students with documented disabilities.
   - http://www.mnstate.edu/disability/

Technical Skills: Certain minimum technical skills are expected. I expect you to be able to:

1. Navigate the main course websites and links within:
   - Course homepage: http://web.mnstate.edu/jasperse/Online/chem350online.htm
   - Lectures and Activities Page: http://web.mnstate.edu/jasperse/Online/Lectures350online-summer.html
   - Practice Tests Page: http://web.mnstate.edu/jasperse/Chem350/Practice%20Tests/Chem350PracticeTests.html
   - Quizzes Page: http://web.mnstate.edu/jasperse/Online/Quizzes350Online.html
2. Access and Navigate D2L Brightspace
   - https://mnstate.ims.mnscu.edu/?target=%2fd2l%2fhome
   - In order to enter D2L Brightspace, you'll need to know your Star ID and password
   - This where you will access grades
3. Use and check e-mail regularly. ☺
   - The default email address will be your mnstate.edu address.
   - If you want to use your different, normal address, email me and for class-related emails I can send to your regular address. But, any university-sourced emails will still go your mnstate.edu address.
4. The ability to take **screen shots** on your device(s) and attach them to emails
   - Often getting good feedback is easiest if you can take a picture of a problem, or something in the notes or in a lecture that you didn't understand, or an online-homework answer that seems wrong or confusing.
   - So the ability to take screen-shot pictures of something on your computer screen and then to email that to me with whatever your related question is helps a lot.
5. The ability to download mp4 video file version of Kaltura videos.
   - Example video: https://mediaspace.minnstate.edu/media/350+AL02.+Normal+Bonding,+Formal+Charge,+Structural+Formulas/0_9sfkh015
   - Click on guest/login in upper right corner; Star ID login to Media Space; download available below video.
   - Students who don't always have fast streaming internet, downloading the podcasts to your computer allows viewing without fast internet.

Technical Support

1. MSUM IT Help Desk: phone 218.477.2603; support@mnstate.edu; drop-in Library 122.
   - http://www.mnstate.edu/helpdesk/
   - Student specific: https://www.mnstate.edu/helpdesk/students.aspx
   - Helpfiles for various tasks: https://www.mnstate.edu/helpdesk/helpfiles.aspx
2. D2L Brightspace Tutorials are available for students:
   - https://www.mnstate.edu/instructional-technology/desire2learn/
   - http://www.mnstate.edu/instructional-technology/desire2learn/#tabs-4
3. Achieve: https://macmillan.force.com/macmillanlearning/s/chat-with-us
4. Other problems: mailto:jasperse@mnstate.edu

Accessibility

Minnesota State University Moorhead is committed to providing equitable access to learning opportunities for all students and strives to make courses inclusive and accessible in accordance with sections 504 and 508 of the Rehabilitation Act and the Americans with Disabilities Act. The University will make reasonable accommodations for students with documented disabilities. The Disability Resource Center (DRC) is the campus office that collaborates with students in need of special accommodations to assist in providing and/or arranging reasonable accommodations.

If you have, or think you may have, a disability (e.g. mental health, attentional, learning, chronic health, sensory or physical):

- Please contact the DRC at (218) 477-4318 (V) or (800) 627.3529 (MRS/TTY) to schedule an appointment for an intake.
- Online students may need to schedule a phone meeting or web conference.
- If you are already registered with the DRC and have a current Accommodation Letter, please schedule an appointment to visit with me, during my office hours, to discuss implementation of your accommodations.
- Additional information is available on the DRC website: http://www.mnstate.edu/disability/

Technology Privacy Policies and Accessibility Statements

Links to the privacy policies and accessibility statements for third party software used in this course are listed here.

Heavily Used Technologies:

- Dreamweaver
  Accessibility: http://www.adobe.com/accessibility/products/dreamweaver.html
- Adobe Acrobat Reader
  Accessibility: http://www.adobe.com/accessibility/compliance/acrobat-xi-standard-section-508-vpat.html
  http://www.adobe.com/accessibility/products/acrobat.html

Modestly Used Technologies:

- D2L Brightspace
  Privacy: http://www.brightspace.com/legal/privacy/
  Accessibility: http://www.brightspace.com/accessibility/
  http://www.brightspace.com/accessibility/standards/

Rarely Used Technologies (but may pop up a couple of times or situations.)

- Java Accessibility: http://www.oracle.com/technetwork/articles/javase/downloads-jsp-138220.html
- Miscrosoft Word Accessibility: http://www.microsoft.com/enable/microsoft/section508.aspx
- MS products: https://www.microsoft.com/enable/microsoft/section508.aspx

Course Summary

MSUM Bulletin Course Description: **CHEM 360. Organic Chemistry 2. 3 Credits**. The structure, nomenclature, reactions, reaction mechanisms, and synthesis of carbon compounds that contain oxygen and nitrogen. Prerequisites: CHEM 350 (Organic Chemistry I).

Instructor Description: The course is the second semester of a fairly standard two-semester lecture course in organic chemistry, designed for science majors, including those preparing for health professions. (No online lab.) Coverage includes nomenclature, structure, properties, and the synthesis, reactions, and reaction mechanisms of organometallics, alcohols, aldehydes, ketones, amines, carboxylic acids, and carboxylic acid derivatives. Spectroscopy is covered. Reactions covered include redox reactions; Grignard and organometallic reactions; cationic and anionic addition, elimination, and substitution reactions; Wittig reactions; aldol, Claisen and other enolate reactions; and hydrolysis reactions among others. Reaction mechanisms are emphasized. Product prediction, synthesis design, and retrosynthesis skills are emphasized. Structure, stability, relative reactivity, and acid-base chemistry are included.

ONLINE LAB IS NOT POSSIBLE.

Required work includes tests, online homework, and some "quizzes". Multiple self-assessment tools are available (sample problems in lecture; online homework problems; textbook problems; extra practice sets; and practice tests.) While this is an online course, it is similar to a traditional course in that videos of actual face-to-face lectures are used (with the advantage of pause-and-rewind). Answers and video explanation of all problems on the practice sets and practice tests are provided. Tests are NOT taken online; hand-written on-paper tests must be taken either at MSUM or using a proctor. The course is go-at-your-own-pace; there are no fixed test dates, and it can be started early.

Instructional Materials: Detailed class notes; video lectures; in-lecture practice/application problems; supporting supplemental videos; videos talking/teaching through the process for processing/answering each practice problem in the practice sets; feedback and tutorials within Achieve online homework; videos talking through the process for processing/answering each of the practice test case study problems; textbook readings; textbook problems; solutions manual explaining/teaching the process for processing/answering practice problem in the book homework.

Activities/Practice: The course includes an extensive and diverse range of activities ("practice problems") to enable students to apply what they are learning, to practice the types of skills they will need, and to effectively prepare for the tests. These activities include: 1. Extensive in-lecture in-notes practice problems; 2. Practice sets online (≥4 per test; 3. Practice Tests (≥3 per test); 4. Achieve online homework problems; 5. "Quizzes" (open notes, take-home); and 6. Textbook practice problems. Of these the Achieve online homework and the "quizzes" are required and graded. All of the others have answer keys available. For practice sets and practice tests, online videos are provided walking through each problem. Of these, the Achieve online homework and the quizzes will be required and count towards your grade.

Self-Assessment: How do you know if you're mastering the material, and are eventually going to be prepared to score well on the tests? See whether you are consistently understanding and correctly answering the problems in the:
1. In-lecture problems; 2. Practice sets online; 3. Practice Tests; 4. Achieve online homework problems; and 5. Book practice problems.

Graded Assessment (Required Work): 1. Achieve online homework 2. Quizzes. 3. Tests.
The test scores will make up >80% of the class points. Achieve and the quizzes will combine for the other >15%.

COURSE OBJECTIVES / OUTCOMES / COMPETENCIES. By the end of the course, students should be able to do the following:

- See Test1-4 Objectives/Competencies as listed in the syllabus and on the main course website for more detailed listing of course objectives.

1. **Nomenclature**. Provide correct IUPAC names for alcohols, aldehydes, ketones, amines, carboxylic acids, and esters.
2. **Predict and explain Patterns and Properties**. Predict and explain patterns in structure, hybridization, acidity, basicity, solubility, and reactivity for alcohols, aldehydes, ketones, amines, carboxylic acids, acid chlorides, anhydrides, esters, and amides by understanding and applying concepts of organic structure and bonding and stability.
3. **Acid-Base**: Predict, rank, and apply acidities of carboxylic acids, phenols, water, alcohols, ketones, esters, 1,3-dicarbonyls, and ammoniums, and predict, rank, and apply basicities of their conjugate bases, relative to other acids and bases. Apply the impact of electron donors or withdrawers, and the impact of lone-pair hybridization.
4. **NMR:** Demonstrate understanding of fundamental 1D Nuclear Magnetic Resonance spectroscopy. This will include being able to solve for chemical structure given an H-NMR or C-NMR spectrum and a molecular formula; being able to predict 1H-NMR chemical shifts, splitting and integration; being able to predict C-NMR chemical shifts; being able to diagnose NMR equivalence and non-equivalence; being able to demonstrate fluency in the terminology of NMR; and being able to use Infrared Spectroscopy to identify characteristic functional groups.
5. **Predict reaction products**. Be able to predict products in the reactions of alcohols, aldehydes, ketones, amines, carboxylic acids, acid chlorides, anhydrides, esters, and amides.
6. **Synthesis Reactions**: Demonstrate understanding of reactions and reaction pathways involved in the synthesis of alcohols, aldehydes, ketones, amines, carboxylic acids, acid chlorides, anhydrides, esters, and amides.
7. **Draw Mechanisms.** Draw logical and detailed mechanisms for various fundamental reactions involving alcohols, aldehydes, ketones, amines, carboxylic acids, acid chlorides, anhydrides, esters, and amides.
8. **Synthesis Design**: Given a starting chemical, suggest reactants or sequences of reactions/reactants that could transform the starting material into a target product.
9. **Retrosynthetic analysis and Synthesis Design**. Use retrosynthetic analysis to design efficient one-step or multistep syntheses involving alcohols, aldehydes, ketones, amines, carboxylic acids, acid chlorides, anhydrides, esters, or amides as starting materials, intermediates or final products
10. **Classify, explain, and apply fundamental reactions.** Be able to recognize, classify, explain, and apply fundamental organic reactions such as oxidation reactions; reduction reactions; Grignard reactions; anionic additions; acid-catalyzed additions, eliminations, and substitutions; enolate reactions; hydrolysis reactions; and interconversions between carboxylic acids, acid chlorides, anhydrides, esters, and amides.
11. **Demonstrate Understanding in Miscellaneous Scenarios Involving Alcohols, Aldehydes, Ketones, Amines, Carboxylic Acids, Acid Chlorides, Anhydrides, Esters, and Amides.** Answer questions and explain/predict/apply physical properties, nomenclature, synthesis, reactions, mechanisms, and synthesis design/retrosynthesis to scenarios involving alcohols, aldehydes, ketones, amines, carboxylic acids, acid chlorides, anhydrides, esters, and amides.

Instructional Materials: Detailed class notes; video lectures; in-lecture practice/application problems; supporting supplemental videos; videos talking/teaching through the process for processing/answering each practice problem in the practice sets; feedback and tutorials within Achieve online homework; videos talking through the process for processing/answering each of the practice test case study problems; textbook readings; textbook problems; solutions manual explaining/teaching the process for processing/answering practice problem in the book homework.

Activities/Practice: The course includes an extensive and diverse range of activities ("practice problems") to enable students to apply what they are learning, to practice the types of skills they will need, and to effectively prpare for the tests. These activities include: 1. Extensive in-lecture in-notes practice problems; 2. Practice sets online (≥4 per test); 3. Practice Tests (≥3 per test); 4. Achieve online homework problems; 5. "Quizzes" (open notes, take-home); and 6. Textbook practice problems. Of these the Achieve online homework and the "quizzes" are required and graded. All of the others have answer keys available. For practice sets and practice tests, online videos are provided walking through each problem. Of these, the Achieve online homework and the quizzes will be required and count towards your grade.

Self-Assessment: How do you know if you're mastering the material, and are eventually going to be prepared to score well on the tests? See whether you are consistently understanding and correctly answering the problems in the:
1. In-lecture problems; 2. Practice sets online; 3. Practice Tests; 4. Achieve online problems; and 5. Book practice problems.

Graded Assessment (Required Work): 1. Achieve online homework 2. Quizzes. 3. Tests.

- The test scores will make up ~80% of the class points. Achieve and the quizzes will combine for the other ~20%.

TEST ONE SKILLS/OBJECTIVES / OUTCOMES / COMPETENCIES

- The following list specifies **major** skills/competencies that you may be asked to demonstrate on tests.
- The list should not be viewed as exhaustive; anything that is addressed in the notes and is not designated either in the notes or in the lectures as "not test responsible" should be considered to be fair game for test assessment.

Ch		TEST ONE. ALCOHOL CHEMISTRY	Self-Assessment (Some but not all Graded)	Graded Assessment
10	Structure and Synthesis of Alcohols	1. Nomenclature: Draw and name alcohols, phenols, and diols, including alkenols and cyclic alcohols; or given a name, be able to draw the structure. 2. Physical Properties: Predict and rank relative boiling points and solubilities of alcohols relative to other organic structures. 3. Predict products or specify reactants involved in the conversion of alkenes, alkyl halides, or carbonyl compounds to alcohols; and be prepared to use these transformations in multi-step synthesis scenarios, whether that be product prediction or synthesis design or retrosynthesis. 4. Grignard Reactions: Draw the expected products when organomagnesium reagents (Grignard reagents) react with aldehydes, ketones, esters (including cyclic esters), formaldehyde, or epoxides. 5. Organometallic compatibility: Identify which solvents are appropriate for use when preparing and using RMgBr reagents; identify which haloalkanes could be effectively converted to RMgBr reagents and subsequently reacted intermolecularly with other carbonyls. 6. Rank the relative reactivities of aldehydes, ketones, esters, alcohols, or water towards strong nucleophiles/bases such as RMgBr reagents. 7. Mechanisms: Use arrow-pushing to display electron movement in chemical reactions involving RMgBr, LiAlH4, or NaBH4 and aldehydes, ketones, esters (including cyclic esters), or epoxides. 8. Synthesis Design: Given a starting chemical, suggest reactants or sequences of reactions/reactants that could transform the reactant into a target product. (Presumably involving an alcohol as reactant, intermediate, or final product.) 9. Retrosynthesis: Identify different combinations of chemicals that could be used to synthesize 1º, 2º, or 3º alcohols or derivatives thereof. 10. Hydride Reduction Reactions: Predict products for reactions involving sodium borohydride or lithium aluminum hydride, including selective or non-selective reductions involving more than one carbonyl. Also be able to identify an appropriate hydride reducing agent for a particular reduction reaction.	1. In-lecture in-notes problems 2. Practice sets online 3. Practice Tests 4. Achieve homework problems 5. Book practice problems	1. Achieve homework 2. Quiz 1 3. Test 1 4. Final Exam
11	Reactions of Alcohols	11. Acid-Base: Predict and rank acidities and basicities of alcohols and alkoxides relative to other organic structures; and predict when acid/base reactions will or won't be product favored 12. Extraction: Identify and explain which chemicals will be extracted from an organic solvent into neutral water or into NaOH/water 13. Predict the products (multi-reactions sequences may be involved) for reactions sequences involving alcohols and • Reducing metals such as elemental Na or K • Bases • Oxiding agents such as PCC and H2CrO4 • Dehydrating agents such as H2SO4 or H3PO4 • Halogenating agents such as HBr, PBr3, HCl, HI, and SOCl2 (including stereochemistry) • Sulfonating agents such as TsCl and subsequent reactions 14. Chemical Tests: Identify possible structures for a chemical given a chemical formula and chemical test results (Jones, Lucas, H_2/Pt reaction…) 15. Mechanisms: Draw mechanisms for ROH → RX reactions, using HBr (or HCl or HI) or PBr3. 16. Synthesis Design: Given a starting chemical, suggest reactants or sequences of reactions/reactants that could transform the reactant into a target product. (Presumably involving an alcohol as reactant, intermediate, or final product.) 17. Retrosynthesis: Design syntheses involving different combinations of chemicals that could be used to synthesize 1º, 2º, or 3º alcohols or derivatives thereof. A limited array of possible starting chemicals will be allowed.	1. In-lecture in-notes problems 2. Practice sets online 3. Practice Tests 4. Achieve homework problems 5. Book practice problems	1. Achieve homework 2. Test 1 3. Final Exam

TEST TWO SKILLS/OBJECTIVES / OUTCOMES / COMPETENCIES

- The following list specifies **major** skills/competencies that you may be asked to demonstrate on tests.
- The list should not be viewed as exhaustive; anything that is addressed in the notes and is not designated either in the notes or in the lectures as "not test responsible" should be considered to be fair game for test assessment.

Ch		TEST TWO Nuclear Magnetic Resonance Spectroscopy and Infrared	Self-Assessment (Some but not all Graded)	Graded Assessment
13	Nuclear Magnetic Resonance Spectroscopy	1. Given a structure, determine which protons or which carbons are equivalent and which are nonequivalent 2. Given a structure, predict the approximate chemicals shifts for the hydrogens or the carbons 3. Use integrals to determine the relative numbers of different types of protons. 4. Use proton spin-spin splitting patterns, combined with integration and chemicals shifts, to determine the structure of alkyl and other groups and to track as far as possible from one end of a molecule. 5. Given a chemical structure, predict the approximate integration, chemical shift, and splitting for each hydrogen signal set. 6. Given a chemical structure, predict the approximate chemical shift for the carbons, and perhaps the splitting that would occur were a carbon NMR to be acquired. 7. Use integration, splitting, and chemical shifts to recognize and identify common groups, for example hydroxyl; methyl, ethyl, isopropyl, propyl; methoxy, ethoxy, isopropoxy, propoxy; methyl carbonyl, ethyl carbonyl, isopropyl carbonyl, propyl carbonyl; monosubstituted benzene, and disubstituted benzene. Given a chemical formula and an H-NMR, use the integration, chemical shifts, and splitting to solve for the structure of the chemical. 8. Distinguish overlapping signals from "clean" signal sets in an H-NMR. 9. Demonstrate and apply common terminology, such as "upfield" and "downfield"; "shielding" versus "deshielding"; and "methylene" and "methine" as well as methyl. 10. Demonstrate an understanding of the additive impact of functional groups on systems that have multiple functional groups. 11. Given a formula and a C-NMR, solve for a plausible structure of the chemical. 12. Given a formula, use whatever combination of H-NMR, C-NMR, and infrared data that is provided to solve for the structure of the chemical.	1. In-lecture in-notes problems 2. Practice sets online 3. Practice Tests 4. Achieve homework problems 5. Book practice problems	Achieve homework Test 2 Final Exam
12	Infrared Spectroscopy	13. Given an IR spectrum or summary, identify characteristic peaks, particularly for OH and carbonyl groups 14. Distinguish whether a carbonyl is present, including whether it is saturated or unsaturated. 15. Distinguish whether an alcohol hydroxyl group is present.. 16. Given formulas with one or two oxygens present, identify which functional groups are present (such as ester; alcohol; carboxylic acid; hydroxyl ketone; ether; and saturated versus unsaturated carbonyl). 17. Match characteristic peaks with actual molecules. 18. Use IR in combination with H-NMR to solve for the structures of chemicals.	1. In-lecture in-notes problems 2. Practice sets online 3. Practice Tests 4. Achieve homework problems 5. Book practice problems	Achieve homework Test 2 Final Exam

TEST THREE SKILLS/OBJECTIVES / OUTCOMES / COMPETENCIES

- The list should not be viewed as exhaustive; anything that is addressed in the notes and is not designated either in the notes or in the lectures as "not test responsible" should be considered to be fair game for test assessment.

		TEST THREE: Aldehydes, Ketones, and Enolate Chemistry	**Self-Assessment**	**Graded Assessment**
18	Ketones and Aldehydes	1. Nomenclature: Draw and name aldehydes and ketones, including in the context of multifunctional molecules where decisions about which groups are treated as substituents are necessary; or, given a name, be able to draw the structure. 2. Physical Properties: Predict and rank relative boiling points and solubilities of carbonyl compounds relative to other organic structures. 3. Carbonyl Synthesis: Process reactions for synthesis of ketones or aldehydes from alcohols, alkenes, alkynes, carboxylic acids, nitriles, acid chlorides, or aromatic compounds. This could involve predicting a product, specifying a starting material, designating an appropriate reactant, or proposing an effective synthesis. Single-step or multistep reactions may be involved. 4. Carbonyl Reactions: Predict the products for reactions (including multi-step reactions) of ketones and aldehydes with the following types of compounds: a. Hydride reducing agents (NaBH4, LiAlH4) b. Organomagnesium reagents (Grignard reagents) c. HCN d. Water under acid or base conditions (reversible hydrate formation) e. Alcohols (reversible hemiactal and acetal formation, including cyclic hemiacetals and acetals; and the reverse reactions involving acetal hydrolysis) f. Amines (reversible aminol and imine formation, including cyclic aminols and imines, and the reverse reaction involving imine hydrolysis) 5. Mechanisms: Be able to draw mechanisms for carbonyl reactions listed above, including the reverse reaction, including those involving rings. Major mechanisms include addition (anionic or acid-catalyzed), elimination, and substitution reactions. 6. Demonstrate/apply understanding of whether a mechanism is anionic or cationic. 7. Rank the relative reactivities of aldehydes, ketones, and esters. 8. Demonstrate understanding/application of protection and deprotection procedures. 9. Chemical Tests: Identify structure based on tests (including DNP and Tollens Tests) 10. Draw the starting materials that would react to produce a given product. 11. Synthesis Design: Given a starting chemical, suggest reactants or sequences of reactions/reactants that could transform the starting material into a target product. 12. Retrosynthesis: Design syntheses of targets, given a restricted pool of allowed starting materials. (Presumably involving carbonyls.)	1. In-lecture problems 2. Practice sets online 3. Practice Tests 4. Achieve homework problems 5. Book practice problems	Achieve homework Quiz Test 3 Final Exam
22	Alpha Substitutions and Condensations of Enols and Enolate	13. Acid-Base: Predict and rank acidities and basicities of ketones, esters and 1,3-dicarbonyl compounds relative to other acids and bases; predict when acid/base reactions will or won't be product favored; apply understanding of equilibria. 14. Predict when bases (hydroxide, alkoxide, versus LDA) will afford "complete" versus "small equilibrium" versus zero population of enolate anion 15. Predict the products (multi-reactions sequences may be involved) when enolate anions react with the following electrophiles: • Proton (racemization, reversible enol formation) • Halogen (including polyhalogenatin) • Alkyl halides (including usage of LDA as base) • Aldehydes/ketones (aldol reaction resulting in beta-hydroxy carbonyls; aldol condensations resulting in enones; including intramolecular versions) • Esters (Claisen reactions, including intramolecular versions) 16. Mechanisms: Draw mechanisms for each of the above reactions 17. Predict the product for reactions (including multistep reactions) involving carbonyls and phosophorus ylides (Wittig reaction) 18. Process reactions involving 1,3-dicarbonyls, including ester hydrolysis and thermal decarboxylation of 1,3-carbonyl acids. 19. Process keto-enol equilibration and mechanism, and rank amounts of enol. 20. Chemical Tests: Identify possible structures for a chemical given a chemical formula and chemical test results (including Iodoform, DNP and Tollens Tests) 21. Draw the starting materials that would react to produce a given product. 22. Synthesis Design: Given a starting chemical, suggest reactants or sequences of reactions/reactants that could transform the starting material into a target product. (Presumably either involving enolate chemistry. Synthesis of alkenes via aldol condensation or Wittig reaction will also be a priority skill.) 23. Retrosynthesis: Design syntheses of targets, given a restricted pool of allowed starting materials.	1. In-lecture problems 2. Practice sets online 3. Practice Tests 4. Achieve homework problems 5. Book practice problems	Achieve homework Test 3 Final Exam

TEST FOUR SKILLS/OBJECTIVES / OUTCOMES / COMPETENCIES

- The list should not be viewed as exhaustive; anything that is addressed in the notes and is not designated either in the notes or in the lectures as "not test responsible" should be considered to be fair game for test assessment.

		TEST FOUR	**Self-Assessment**	**Graded Assessment**
19	Amines	1. Nomenclature: Name amines, and draw structures given names. 2. Physical Properties: Predict and rank relative boiling points and solubilities of amines compounds relative to other organic structures. 3. Contrast physical properties of amines with those of ammonium salts. 4. Acid-Base: Predict and rank basicities of amines and acidity of ammoniums relative to other bases and acids. 5. Determine nitrogen atom hybridization and lone-pair hybridizaton; and apply to amine basicity and ammonium acidity. 6. Amine Reactions: Predict the products or identify starting materials for for reactions (including multi-step reactions) of amines, including with proton donors (acid-base); carbonys (imine formation); alkyl halides (alkylation and polyalkylation); acid chlorides (amide formation); carboxylic acids (acylation, amide formation); and carbonyl in the presence of H+/NaBH3CN (reductive amination). 7. Amine Synthesis: Demonstrate understanding of amine synthesis. This could involve predicting a product, specifying a starting material, designating an appropriate reactant, or proposing an effective synthesis. Major amine precursors include carbonyls (reductive amination; 1º, 2º, or 3º amines possible); amides (1º, 2º, or 3º amines); nitro compounds (1º); alkyl halides and ammonia (1º), and nitriles (1º). 8. Mechanisms: Be able to draw mechanisms for reactions including acid-base reactions; alkylation; polyalkylation; and acylation. 9. Draw the starting materials that would react to produce a given product. 10. Synthesis Design: Given a starting chemical, suggest reactants or sequences of reactions/reactants that could transform the starting material into a target product. 11. Retrosynthesis: Design syntheses of targets, given a restricted pool of allowed starting materials.	1. In-lecture problems 2. Practice sets online 3. Practice Tests 4. Achieve homework problems 5. Book practice problems	Achieve homework Test 4 Final Exam
20, 21	Carboxylic Acids and Carboxylic Acid Derivatives	12. Nomenclature: Name carboxylic acids, esters, and carboxylates; and draw structures given names. 13. Physical Properties: Predict and rank relative boiling points and solubilities of carboxylic acids relative to other organic structures. 14. Acid-Base: Predict and rank acidity of carboxylic acids and basicity of carboxylates relative to other bases and acids. 15. Diagnose how electron donors or withdrawers impact acidity/basicity. 16. Determine which version of an amino acid monomer exists at different pH's 17. Carboxylic Acid Synthesis: Use chemical equations to demonstrate understanding of carboxylic acid synthesis reactions, including: hydrolysis of acid chlorides, anhydrides, esters, or amides under neutral, acidic, or basic conditions; oxidation of alcohol, alkene, or alkyl benzenes; carboxylation of Grignard reagents; hydrolysis of nitriles; or hydrolysis/decarboxylation of 1,3-diesters. 18. Carboxylic Acid Reactions: Use chemical equations to demonstrate understanding of carboxylic acid reactions, including direct or indirect conversion to acid chlorides; anhydrides; esters; amides. 19. Interconversions among Carboxylic Acids and Derivatives: Use chemical equations to predict products, identify starting materials, and design pathways for interconversions between carboxylic acids, acid chlorides; anhydrides; esters; amides, and carboxylates. 20. Mechanisms: Be able to draw mechanisms for interconversions between carboxylic acids, acid chlorides; anhydrides; esters; amides, and carboxylates, including "downhill" reactions and acid-catalyzed "lateral" conversions within the ClAvENO series. 21. Draw the starting materials that would react to produce a given product. 22. Synthesis Design: Given a starting chemical, suggest reactants or sequences of reactions/reactants that could transform the starting material into a target product. 23. Retrosynthesis: Design syntheses of targets, given a restricted pool of allowed starting materials.	1. In-lecture problems 2. Practice sets online 3. Practice Tests 4. Achieve homework problems 5. Book practice problems	Test 4 Final Exam

Safety & Procedural Information

MSUM Sexual Violence Policy: Acts of sexual violence are intolerable. MSUM expects all members of the campus community to act in a manner that does not infringe on the rights of others. We are committed to eliminating all acts of sexual violence.

MSUM faculty and staff are concerned about the well-being and development of our students. We are obligated to share information with the MSUM Title IX Coordinator in certain situations to help ensure that the students' safety and welfare is being addressed, consistent with the requirements of the law. These disclosures include but are not limited to reports of sexual assault, relationship violence, and stalking. If you have experienced or know someone who has experienced sexual violence, services and resources are available. You may also choose to file a report. For further information, contact Lynn Peterson, Title IX Coordinator, petrsnly@mnstate.edu; 218-477-2967, or Ashley Atteberry, Director of Student Conduct & Resolution, ashley.atteberry@mnstate.edu 218-477-2174; both located in Flora Frick 153. Additional information is available online mnstate.edu/titleix.

Bias Incident Statement: A bias incident is an act of bigotry, harassment, or intimidation that is motivated in whole or in part by bias based on an individual's or group's actual or perceived race, color, creed, religion, national origin, sex, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, or familial status. If you are a student who has experienced or witnessed a hate or bias incident, we want to address the incident and provide you with resources. Contact the Campus Diversity Officer, Jered Pigeon (jered.pigeon@mnstate.edu, 218-477-2047, 114 CMU) or the Dean of Students, Kara Gravley-Stack (kara.gravleystack@mnstate.edu, 218-477-4222, 153 Flora Frick Hall). Additional information is available at: https://www2.mnstate.edu/oscar/.

Student Grievance/Complaint Process: This general procedure is applicable only to those administrative actions for which no special grievance procedure has been established. Special procedures have been established for certain academic (e.g., graduation, grades), student conduct, discrimination/harassment, and employment related matters. Students desiring to appeal actions or procedures of University administrative offices must meet with the following officials, continuing up the hierarchy as necessary to resolve the issues.

Academic Affairs

1. Department Chair of the academic discipline in which the problem arose
2. Dean of that college discipline
3. Provost and Senior Vice President for Academic Affairs
4. President

Administrative Affairs

1. Director of specific area
2. Vice President for Administrative Affairs
3. President

Student Affairs

1. Director of specific area
2. Vice President for Student Affairs
3. President

This process can also be found in the Policies and Procedures section of the Student Handbook (p. 12) (mnstate.edu/student-handbook/).

Building Emergency Plans: Whether taking your courses online, hybrid, Hyflex, or face-to-face, you may find yourself on campus at some point, so best to be prepared and aware. Building floor plans showing emergency exit routes, fire extinguisher locations and fire alarm pull stations are conspicuously located in classrooms, labs, conference rooms, departmental main offices and residence halls. The Emergency Preparedness Guides (flip style booklets) are located with the maps. Please review the floor plans as well as the guide so you know how to respond in an emergency to help protect yourself and others. If you have questions, please contact Ryan Nelson, Director of Public Safety, at ryan.neslon@mnstate.edu or 218-477-5869. (mnstate.edu/public-safety/).