# ORGANIC CHEMISTRY I: CHEMISTRY 350 SYLLABUS (Course ID = 000620)
## Online Class - Spring 2025



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|---|---|
| Dr. Craig P. Jasperse | web: https://collaborate.mnstate.edu/public/blogs/jasperse/online-organic-chemistry-courses/online-organic-chemistry-i-350-fall-spring/ or http://web.mnstate.edu/jasperse/Online/chem350online.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-W-F 9-10:30; M-T-W-F 1-2:30. But much afternoon time is available, too….) |

# ORGANIC CHEMISTRY I: CHEMISTRY 350-ONLINE SYLLABUS
# SPRING 2025

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**Course Description**: **CHEM 350. Organic Chemistry I. 3 Credits**. Introduction to the classification, structure, reactions, and reaction mechanisms of carbon compounds. Prerequisites: CHEM 210 (General Chemistry II).

Required/Recommended Text and Materials:

1) Required online "ACHIEVE/SAPLING" homework. https://achieve.macmillanlearning.com/, 2025 Course ID = hcdbvd
2) Recommended Text: "Organic Chemistry", Wade+Simek", 9th edition, Pearson. 8th or 7th edition of Wade is fine; or a version of Klein's Organic Chemistry as used at NDSU; or certain other texts, contact me to maybe use what you have..)
   - Note: For more details and purchase links, see: http://web.mnstate.edu/jasperse/Required-Text-and-Materials.pdf
   - Problem listing from other textbooks: https://web.mnstate.edu/jasperse/Chem350/Other-Textbooks.html
3) Solutions Manual: Get a solutions manual that matches the textbook edition you get.

Test Schedule

| | |
|---|---|
| Test #1 (100 pts) | Ch. 1 Introduction and Review<br>Ch. 2 Structure and Properties of Organic Molecules<br>Ch. 3 Structure and Stereochemistry of Alkanes |
| Test #2* (100 pts) | Ch. 4 The Study of Chemical Reactions<br>Ch. 5 Stereochemistry<br>Ch. 6 Alkyl Halides: Nucleophilic Substitution and Elimination |
| Test #3 (100 pts) | Ch. 7 Structure and Synthesis of Alkenes<br>Ch. 8 Reactions of Alkenes |
| Test #4 (100 pts) | Ch. 15 Conjugated Systems and Orbital Symmetry<br>Ch. 16 Aromatic Compounds<br>Ch. 17 Reactions of Aromatic Compounds |
| Final Exam (150 pts)<br>Complete by May 14 | Comprehensive Final Exam |

| Grading Summary: | | Tentative letter grades | |
|---|---|---|---|
| Tests | 400 points (4 x 100) | A/A- | ≥90% |
| Final exam | 150 points (1 x 150) | B-/B/B+ | ≥80% |
| Take-Home Quizzes | 27 points | C-/C/C+ | ≥70% |
| On-Line Homework | 73 points (prorated) | 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 all of the same material tested previously on Tests 1-4.

**Jasperse website**: https://collaborate.mnstate.edu/public/blogs/jasperse/online-organic-chemistry-courses/online-organic-chemistry-i-350-fall-spring/
Or "classic" site: http://web.mnstate.edu/jasperse/Online/chem350online.htm Both websites sites provide links to:

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

**On-line "Achieve/Sapling" homework Problems**: You will be required to buy access to an on-line homework system (see later page in syllabus for details.) These problems will be computer-graded, will give you some practice and sometimes tips, and will help to keep you from procrastinating.

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

| Video | Topic | | Reading |
|---|---|---|---|
| | **Organic Chemistry 1, Jasperse, Wade Version 9**<br>For other editions of Wade, or some other usable textbooks, see:<br>http://web.mnstate.edu/jasperse/Chem350/Other-Textbooks.html | | |
| | **TEST 1 LECTURES** | | |
| 1 | Intro. Why Carbon is Special, Normal bonding, Lewis Structures in Organic | | 1.1-1.6 |
| 2 | 1. Normal Bonding. 2. Formal Charge and Abnormal Bonding. 3. Electronegativity | | **1.7**, 1.4-1.8 |
| 3 | 1. Structural formulas: Full, Condensed, and Skeletal 2. Resonance Structures | | 1.9-1.11 |
| 4 | 1. Mechanism/Arrow-pushing. 2. Acid-Base Chemistry. 3. Anion Stability Patterns. | | 2:4-7,12 |
| 5 | VSEPR 3D Shape. Drawing 3D; Hybridization; Pi bonds; Isomers, | | 1:12-1-19 |
| 6 | Polarity IMF, Boiling Points, Solubility. Catchup. Functional Groups | | 2.1-3 |
| 7 | Functional Groups. Alkane Nomenclature | | 2.15-2.17 |
| 8 | Alkane Nomenclature. Newman Projections; Torsional and Steric Strain; Cycloalkanes | | 3.1-3.9 |
| 9 | Cyclohexane Chairs, Cis-and-Trans, Structural Isomers | | 3.9-3.16 |
| 10 | Catchup/Practice. First 38 minutes of video 10.<br>**Additional Practice Sets/Videos**: Mechanism Practice; Acid-Base Practice; 3D-Drawing Practice; Newman Projection Practice; Cyclohexane Practice<br>**Test 1 Practice Tests**: V1, V2, V3, V4 | | |
| | **TEST 2 LECTURES** | | |
| 10 | Radical Halogenation; Mechanism; Radicals; Bond Energies; Reaction Energies. Last 12 minutes of Video. | | 4.1-4.7 |
| 11 | Rate Laws, Transition States, Stability-Reactivity Principles | | 4.7-4.13 |
| 12 | Radical Brominations. Major product, mechanism, structure isomers. Stability patterns for carbon radicals, cations, and anions. | | 4.13-4.16 |
| 13 | Chiral vs achiral, Enantiomers, Recognizing/Drawing Mirror Images. | | 5.1-5.3 |
| 14 | Chiral Carbons; Attachment Priorities; R/S Designation; Drawing Chiral Molecules | | 5.3-5.8 |
| 15 | Racemic MIxtures, Optical Activity, Meso, Molecules with More than One Chiral Center | | 5.11-5.16 |
| 16 | Drawing Stereoisomers, Meso Compounds. Alkyl Halides Intro, Classification, and Naming | | 6.1-6.7 |
| 17 | The Sn2 Substitution Reaction. | | 6.8-6.12 |
| 18 | The Sn1 Substitution Reaction. | | 6.13-6.16 |
| 19 | SN1 REactions in More Depth. Elimination Reactions | | Catchup |
| 20 | E1 and E2 Reactions in More Depth; Recognizing Which Reaction Will Occur. Catchup, Practice. | | 7.9-7.15 |
| 21 | Catchup/Practice. First ??? minutes of video 21.<br>**Additional Practice Sets/Videos**: Br2/hv Products/Mechanisms Practice; Introductory Mechanism Practice; Extra Stereochemistry Practice; Extra Mechanisms + Product Prediction Practice<br>**Test 2 Practice Tests**: V1, V2, V3, V4 | | |
| | **TEST 3 LECTURES** | | |
| 21 | Intro to alkenes, Elements of Unsaturation (EU), Last ??? minutes of video 21 | | 7.1-7.6 |
| 22 | Hydrogenation + Isomers; Alkene Nomenclature. E/Z; Heats of Hydrogenation | | 7.7-7.10 |
| 23 | Alkene Synthesis. From RX. Bulky Bases. From Alcohols via Acid-Catalyzed E1. Mechanism Recognition. | | 7.10-8.2 |
| 24 | Addition reactions to Alkenes. Addition of HBr; Acid-Catalyzed HOH Addn. | | 8.1-8.5 |
| 25 | Acid-Catalyzed HOH Addn; Indirect HOH Addn (Hydroboration-Oxidation). Synthesis Design | | 8.5-8.7,8-10 |
| 26 | anti-Mark HBr and HOH addition; Synthesis Design, H2 addn; Br2 addn | | 8.8-8.9 |
| 27 | Br2 and BrOH additions and mechanisms; epoxidation | | 8.12-8.16 |
| 28 | Epoxidation, Dihydroxylation, Ozonolysis. Stereospecific Alkene Reactions. Synthetic Design. | | Catchup |
| 29 | Alkene and Diene Addition Polymers. Catchup/Practice.<br>**Additional Practice Sets/Videos**: Test 3 Extra Practice 1; Test 3 Extra Mechanisms Practice; Test 3 Alkene Reactions Practice; Test 3 Extra Synthesis Practice (6 pages)<br>**Test 3 Practice Tests**: V1, V2, V3, V4 | | |
| | **TEST 4 LECTURES** | | |
| 29 | Conjugation, Molecular Orbitals, Dienes, Allylic Cations, Additions to Dienes. Last ??? minutes of video. | | 15.1-6 |
| 30 | More allylic cations/radicals/conjugation and Applications; | | 15.7-11 |
| 31 | Diels-Alder Reaction; Aromaticity | | 15.11, 16.1-2 |
| 32 | Aromaticity; Huckel's Rule and Complex Aromatics | | 16.1-7 |
| 33 | Complex Aromaticity, Application, Nomenclature<br>(Skip "endo rule" section in 15.11A, p. 684; Skip 15.12,13) | | 16.8-11, 13 |
| 34 | Electrophilic Aromatic Substitution: Intro, Mech, Kinetic Effects | | 17.1,6-8 |
| 35 | Reactions in Detail: Halogenation, Nitration, Sulfonation, Alkylation, Acylation | | 17.2-5,10,11 |
| 36 | Catchup; Addition to Disubstituted Benzenes; Synthetic Applications | | 17.9, practice |
| 37 | Side Chain Reactions; Retrosynthesis; Synthetic Applications; Practice | | 17.14 |
| 38 | Review for Test 4 | | --- |
| 39 | More allylic cations/radicals/conjugation and Applications;<br>**Additional Practice Sets/Videos**: HBr Addn to Dienes + NBS Allylic Bromination; Conjugation-Allylic-Diels-Alder Practice; Aromatic Substitution Mechanisms (Products Provided); Aromatic Substitution Product Prediction/Mechanisms/Synthesis Design<br>**Test 4 Practice Tests**: V1, V2, V3, V4 | | 15.7-11 |
| | 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 with me, 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. And you can start way early!
    - 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.
        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 Tuesday will work. Sometimes evening testing or Saturday mornings testing is possible.
        d. This is the normal default process used by most distance students.

    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.
        - Tuesdays won't be available, but other days I'll have lots of times that can work.

    c. Live-Proctored Testing, local to you.
        1) This is not the normal process, but is an option for distance students in case, for whatever reason, the zoom-proctored testing is problematic.
        2) If necessary, this would typically take place at a local college, library, hospital, church or high school, etc., or with some other responsible individual.
        3) If necessary to use this process, **YOU** will need to email me the email, name, phone number, and job 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! ☺)
        4) 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.

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. **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, and Zoom-proctored may have that option too. 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.

- **Explore the website(s)**: https://collaborate.mnstate.edu/public/blogs/jasperse/online-organic-chemistry-courses/online-organic-chemistry-i-350-fall-spring/ or "classic" site: http://web.mnstate.edu/jasperse/Online/chem350online.htm
- 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**

1. **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.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/ (use hcdbvdID)
   d. Print Syllabus: http://web.mnstate.edu/jasperse/Online/Syllabus350online.pdf
   e. Print Class Notes (double-side print, but best to do full-size):
      - http://web.mnstate.edu/jasperse/Online/Classbook-Chem350-online.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-i-350-fall-spring/
   g. View the video in which I talk through the syllabus and the course.
   - Access from main website, under "Organic Chemistry I - Test 1: Introduction & Alkanes"
   - 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

2. **Preparing for Test 1**
   a. Print To-Do Checklist for Test 1: http://web.mnstate.edu/jasperse/Online/Checklist-350Test1.pdf
   b. Review Skills/Competencies for Test 1: http://web.mnstate.edu/jasperse/Online/Objectives350-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-i-350-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 are two for Test 1)
   **f. Do the practice tests**
   g. Arrange Zoom-testing or proctored testing unless you can test at MSUM.

3. 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 14, 2025)

2. The "Official" semester start date is January 13, 2025
   - You can start earlier, much earlier, if you want

3. Semester Completion date: May 14, 2025.
   a. You can finish early, and you can start early (or late), but you MUST FINISH BY MAY 14
   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 14 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 14), 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, Wednesday, 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 a Monday, 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 next page 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 doesn't have as many lectures and shouldn't take as long.
- Test 4 is very hard. It takes longer to understand and master the content.

**12-week: (see two pages later 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.
  - Finishing within 12 weeks could be helpful if you started late for whatever reason.
- Test 3 doesn't have as many lectures and shouldn't take as long.
- Test 4 is very hard. It takes longer to understand and master the content.

**10-week: (see two pages later 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 11$^{th}$ 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.
- Test 4 is very hard. It takes longer to understand and master the content.

**8-week: (see two pages later 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 9$^{th}$ week studying for and then taking final.
- Test 4 is very hard. It takes longer to understand and master the content.

## Some Suggested Possible Schedules

**Possible/Suggested 16-week Schedule (you can personalize it, and start it earlier or later):**

- **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**<br>https://collaborate.mnstate.edu/public/blogs/jasperse/online-organic-chemistry-courses/online-organic-chemistry-i-350-fall-spring/ |
|---|---|
| Test 1<br>Mon 2/10 | • Lectures 1-10<br>• Finish lectures/Achieve by Monday, Feb 3<br>• Digest/Practice/Integrate Tuesday -till-test |
| Test 2<br>Mon 3/10 | • Lectures 10b-22<br>• Finish lectures/Achieve by Monday, March 3<br>• Digest/Practice/Integrate Tuesday -till-test |
| Test 3<br>Mon 4/14 | • Lectures 22-29<br>• Finish lectures/Achieve by Monday, April 7<br>• Digest/Practice/Integrate Tuesday -till-test |
| Test 4<br>Mon 5/5 | • Lectures 30-39<br>• Finish lectures/Achieve by Monday, April 29<br>• Digest/Practice/Integrate Tuesday -till-test |
| Final<br>Mon 5/12 | • 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.
- 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 14th.
- 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 Jan 13. The more you accomplish before other spring activities/class kick in, the better.
    - Wouldn't it be nice to complete before Easter? Or, perhaps before the end of April, before final exams in other courses are pressing in?
- Test 4 is very hard. It takes longer to understand and master the content.

**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 14), 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 arrange with me. You can also often make case-by-case arrangements with me. Days other than Thursday mornings have lots of flexibility.
- For distance students testing with me via Zoom, you can also make case-by-case arrangements with me. Most weekdays other than Thursday mornings I'll have morning and afternoon times possible. Often one or two evenings per week may be available, and often Saturday mornings can be available.
- You can adjust on the fly, to some degree. For example, suppose you were planning to take Test 1 on Friday, Feb 2, 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…)
- Schedules on the following page could be personalized. For example, if you were starting late, you could choose one of those and bump all the dates back by the appropriate number of weeks.

**Possible/Suggested 12-week Schedule (you can personalize it, and start it earlier or later):**

- **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-i-350-fall-spring/ |
|---|---|
| Test 1<br>Mon 2/3 | • Lectures 1-10a<br>• Finish lectures/Achieve by Monday, Jan 27<br>• Digest/Practice/Integrate Tuesday-till-test |
| Test 2<br>Mon 2/24 | • Lectures 10b-22<br>• Finish lectures/Achieve by Monday, Feb 17<br>• Digest/Practice/Integrate Tuesday -till-test |
| Test 3<br>Mon 3/24 | • Lectures 22-29<br>• Finish lectures/Achieve by Monday, Mar 17<br>• Digest/Practice/Integrate Tuesday -till-test |
| Test 4<br>Mon 4/14 | • Lectures 30-39<br>• Finish lectures/Achieve by Monday, April 7<br>• Digest/Practice/Integrate Tuesday -till-test |
| Final<br>Mon 4/21 | • Study like crazy for the final! It's hard. |

**Possible/Suggested 10-week Schedule (you can personalize it, and start it earlier or later):**

- **This should involve about 6 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<br>Fri 1/31 | • Lectures 1-10a<br>• Finish lectures/Achieve by Monday, 1/27<br>• Digest/Practice/Integrate Tuesday-till-test |
| Test 2<br>Fri 2/14 | • Lectures 10b-22<br>• Finish lectures/Achieve by Monday, 2/10<br>• Digest/Practice/Integrate Saturday-till-test |
| Test 3<br>Fri 3/14 | • Lectures 22-29<br>• Finish lectures/Achieve by Monday, 3/10<br>• Digest/Practice/Integrate Tuesday-till-test |
| Test 4<br>Fri 4/4 | • Lectures 30-39<br>• Finish lectures/Achieve by Monday, 3/27<br>• Digest/Practice/Integrate Tuesday-till-test |
| Final<br>Fri 4/11 | • Study like crazy for a week! It's hard. |

**Possible/Suggested 8-week Schedule (you can personalize it, and start it earlier or later):**

- **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-i-350-fall-spring/ |
|---|---|
| Test 1<br>Mon 1/27 | • Lectures 1-10a<br>• Finish lectures/Achieve by Thursday, 1/23<br>• Digest/Practice/Integrate Friday-till-test |
| Test 2<br>Mon 2/10 | • Lectures 10b-22<br>• Finish lectures/Achieve by Thursday, 2/6<br>• Digest/Practice/Integrate Friday-till-test |
| Test 3<br>Mon 3/3 | • Lectures 22-29<br>• Finish lectures/Achieve by Thursday, 2/27<br>• Digest/Practice/Integrate Friday-till-test |
| Test 4<br>Mon 3/17 | • Lectures 30-39<br>• Finish lectures/Achieve by Thursday, 3/13<br>• Digest/Practice/Integrate Friday-till-test |
| Final<br>Mon 3/24 | • Study like crazy for a week! It's hard. |

**On-Line Lectures**: https://collaborate.mnstate.edu/public/blogs/jasperse/online-organic-chemistry-courses/online-organic-chemistry-i-350-summer/

1. These are normally recorded "Kaltura" lectures from an 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 Achieve 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 ~39 such lectures.
5. "Watching" videos is one thing; understanding everything enough to do everything yourself 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. There are also play-speed options. If I'm lecturing too slowly, you can speed it up.
9. The ability to pause and rewind is really helpful for difficult topics.
10. **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.**

1. These are pretty standard videos. So, if you have internet access, you should be fine.
2. Kaltura test (this is just a standard video):
    - https://mediaspace.minnstate.edu/media/360-AL05-Alcohol-to-Alkoxide-Ether/1_6le0fu0n
3. To be able to download as mp4 files, see note above.
4. For additional syllabus information regarding technical capacity expectations and technical support, see **Technical Skills** and **Technical Support** sections later in syllabus. (Page 18?)

**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 main class website**

| | **Using 50-minute MSUM Kaltura Videos** https://collaborate.mnstate.edu/public/blogs/jasperse/online-organic-chemistry-courses/online-organic-chemistry-i-350-summer/ |
|---|---|
| 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) |

**In-Class Notes: http://web.mnstate.edu/jasperse/Online/Classbook-Chem350-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/Chem350/Practice%20Tests/Chem350PracticeTests.html

- All practice tests in a single document: http://web.mnstate.edu/jasperse/Online/PracticeTests-All-Chem350.pdf
- All practice-test answer keys in a single document:
  - http://web.mnstate.edu/jasperse/Online/PracticeTests-Answers-All-Chem350.pdf

1. There are 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-1.pdf
- All practice-set answer keys in a single document:
  - http://web.mnstate.edu/jasperse/Online/Practice-Sets-Answers-All-Organic-Chemistry-1.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 link above or from the main 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/Sapling On-Line Homework:** https://achieve.macmillanlearning.com/
More details on next 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/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 2025**

- ACHIEVE/Sapling should be ready at least by November 1, 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 73.
     - So, for example, 100% x 73 = 73/73; 90% x 73 = 65.7/73, 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 2025: hcdbvd
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 2025: hcdbvd
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 button that prompts you to use that previous payment.
6. Checkout.
7. Create Account or Sign In

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.
   - http://web.mnstate.edu/jasperse/Chem350/Practice%20Tests/Chem350PracticeTests.html
   - All practice tests in a single document:
     - http://web.mnstate.edu/jasperse/Online/PracticeTests-All-Chem350.pdf
   - All practice-test answer keys in a single document:
     - http://web.mnstate.edu/jasperse/Online/PracticeTests-Answers-All-Chem350.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-1.pdf
   - Practice-set answer keys in a single document:
     - http://web.mnstate.edu/jasperse/Online/Practice-Sets-Answers-All-Organic-Chemistry-1.pdf

**"ChemSurvival" Videos by Professor Ron Davis**: lots of nice videos!

- Full ChemSurvial site: https://www.youtube.com/user/ChemSurvival/videos?flow=grid&view=0
- Relevent ones are often linked from my lectures website.
- Professor Davis's ChemSurvival videos are frequently of very high quality, with excellent molecular-model displays. In many cases where I'd be displaying molecular models while teaching a face-to-face class, the ChemSurvival videos will do a comparable (or usually better) job of enabling visualization.
- Professor Davis is an excellent teacher and communicator, so there may be times when perhaps things just make better sense with some of his videos and explanation than they do in the regular lecture! If so, please take advantage of whatever enables you to learn and master the material!

**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**.

# ORGANIC CHEMISTRY I PROBLEMS
## Based on Organic Chemistry (9th Edition) by L. G. Wade Jr

Note: if you have the 8th, 7th or 6th edition of Wade, or if you have a Klein textbook as used at NDSU, lists of problems are linked from the following website, or you can email me (jasperse@mnstate.edu) to get the list.) Contact me if that's your situation, or see the following link:

- http://web.mnstate.edu/jasperse/Chem350/Other-Textbooks.html

Note: for some links to buy variably new or perhaps older edition of the textbook and the associated solutions manuals, see: https://web.mnstate.edu/jasperse/Required-Text-and-Materials.pdf

| Chapter Topic | Wade Chap | Wade 9 Problems In the Chapter | Wade 9 Problems Back of the Chapter |
|---|---|---|---|
| **Intro, Structure and Bonding** | **1** | 2a-h, 3a-h, 4, 5a-c, 6(omit boron ones), 7a-e, 8a,b, g, 9a, d, 11, 12, 15b, 16, 17, 18, 19, 22, 24a,b, 25 | 29a-g (ionic or not), 31a-e, 32, 33, 35, 37 (ID lone-pairs, and #-of-attached-hydrogens), 41a,b,d,e,g, 42a,b,d, 43a,c, 44a,b,e, 58a,c,e 59a-f<br><br>23, 25-29, 31, 34, 35.1, 36, 37, 40-43, (for 42 and 43, you should be able to process $H_2SO_4$ by memory, the others by structure without needing to look at a list of acidity values), 45 (use nucleophile/electrophile designation, and definitely practice the arrow pushing), 46, 47a,b,d |
| **Acids, Based, Functional Groups** | **2** | 5, 6b,c,d,e, 7, 13a,e, 24 (ignore the "cyclo" part), 25, 26(skip d,f), 27 (skip h), | 31 (ignore the solubility-in-water prediction part), 32a-e, 33, 35a,b,e, 36(b,c,d only), 37(ignore HF), 38(ignore first two), 41a-c, 42a,c,f, 45a, 46a, 47a, 49, 55a-l, 56a-f, 57(ignore sulfide) |
| **Alkanes** | **3** | 1a, 2a, 3, 4a-d,f, 5, 6a,b, 7a,b, 9a, 12, 16a,d,e, 17, 18, 25-27, 29 | 34, 35, 36(omit c and d), 37 (omit b), 39 (omit e,g,h), 41, 42b, 44, 45a,b, 46, 48, 51 |
| **Chemical Reactions.** | **4** | 1a-c, 2, 4a, 9a, 11-13, 18, 19a-d, 24, 25, 28-32. | 34-37, 40, 42-45, 47a,b,e |
| **Stereo chemistry** | **5** | 2 (label as chiral or achiral. If chiral, also draw the enantiomer.), 3 (star chiral C's, identify each chiral molecule, and be able to draw the enantiomers.), 4, 5 (assign as chiral or achiral), 6 [skip f,g. For all others, give the (R)/(S) designations.], 14, 20a-e, 21 (skip f), 22, 23c | 25, 26a,c,d,j-p , 27, 30d, f-h 31a, f-i, 36 |
| **Alkyl Halides: SN2, SN1, E2, E1 Reactions** | **6** | 1, 2c,e,f, 3.1,3, 6, 7 (the density of chloroform is 1.50), 8a, 10 $S_N2$ Reactions: 11-13, 14a,b,d,e, 15(skip b,g), 16, 18 (skip neopentyl bromide. And, substitution is more important than leaving group), 19a,b, 20(skip c,e,f),<br>$S_N1$ Reactions: 22, 23, 24, 25, 27, 29 (very interesting. Probably not test fodder.) | 30, 31a,c-e, 32a,b,e,f, 33*, 32("solvolysis" is substitution by solvent, and is always $S_N1$), 35, 37-42, 45 |
| **Alkenes** | **7** | 1 (for b, counting geometric isomers, I count 14 possible alkene isomers and 15 possible cyclic isomers! The answer book only shows a few of the possibilities.), 4, 5a,b,c, 6a,d,e, 7a,e, 8a,c,e, 13b-d (more stable only. Skip the part about how much difference in energy), 16, 17a, 20a,b, 24, 25, 28, 29, 31, 32a, 33(skip f), 35a,b, 37 | 40, 41, 42a-c, 43a,b,d, 44 (for part c: how many rings does it have?), 49a, 50, 52a-c, 53, 56, 57, 58, 61a, |
| **Alkene Addition Reactions** | **8** | 1-4, 6, 8-11, 13-20, 21a-d, 22 (for b, book answer is poor. Should use a hindered base), 23, 24, 29, 30 (mech for ring-opening only), 32b,d, 33, 34b-f, 35 (d,l means racemic mix of chiral products), 36, 37 | 46 (skip f, i, k,o; good practice for "predict the product" reactions.), 47a-l, 49, 50 (good synthesis design practice), 51 (skip e,g,i), 56a, b, c,e,f, 61 |
| **Conjugated Systems** | **15** | 1, 2, 4, 5, 6, 7(skip c), 9, 10-11(NBS=$Br_2$/hv), 12, 14, 15 (skip d), 16 (ignore stereochem), 18 | 24, 25a-d,g-i, 27, 30, 31, 33a-f |
| **Aromatics** | **16** | 3(skip cyclooctatetraene), 5, 7b-d, 8, 12, 15, 16 (pyrrole picture on top of page, Fig 16.12), 17 (purine picture in section 16-9c), 19, 24a, c,e,g | 26a-f, 27a-c,e,f, 28, 32, 34 (hint: N lone pairs are strongly basic when $sp^3$ or $sp^2$ but weakly basic when p), 35, 36, 37 ("xylene" means dimethyl benzene), 43 |
| **Aromatic Reactions** | **17** | 2, 3(p-xylene is 1,4-dimethylbenzene),<br>5, 6, 7, 8, 11, 12, 13, 14b(i-iv), 15a,c, 18, 19a, 20a-c, 43, 44, 46, 48 | 50a,b,d,f,h,j,l, 52a,b,e,f,g, 53b-f,h,i,j,l, 54, 57, 57, 64 |

**Getting Help, Office Hours, Course Communications:**

1. Live Face-to-face office hours, or contact via phone, or via Zoom arrangment:
   - M-W-F 9-10:30; M-T-W-F 1-2:30. . But much other afternoon time is available, too….)
   - No office hours on Thursdays, or M-W-F 10:30-12
   - MSUM office: Hagen 407J. Phone 218.477.2230
   - Zoom-Room: https://minnstate.zoom.us/j/8827046226

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 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. Zoom-Room: https://minnstate.zoom.us/j/8827046226
   e. Online office hours:
      a. M-T-W-F 9-10:30; M-T-W-F 1-2. But much other afternoon time is available, too….)

**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:

1. **APPLY TO MSUM as a "Non-degree seeking student"**: https://www.mnstate.edu/admissions/apply-now/. (Select "Undergraduate Application", then "non-degree seeking student").
   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
      - $20 fee at the end; should be box that says "Pay Now"; click on that and be able to submit payment
   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 5 is preferred, but not essential; later applications through Jan 12 will also work, and there are late-application workarounds possible after that.
      - For later application, a contact person to expedite admission is Alex Elness in admissions. (Email: alexander.elness@mnstate.edu; phone/text 218.304.0104).
      - Both admission AND class registration should be completed by January 12 (barring late-registration workaround)
        - To request late-admission/registration workaround after January 12, contact both Audrey Cloe Messner in admissions. (Email: audrey.cloe@mnstate.edu; office 218.477.2559; cell 218.304.7676) and me, Dr. Jasperse jasperse@mnstate.edu.
        - 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 may get dropped from class roster.

1. **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 in October
   d. Pay First: After registering, pay ≥$300 by start of semester, or you'll maybe 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.
   g. Payment reminders are emailed to your MSUM email, which you may not check? So remember to pay!

2. **Tuition+Fees: Varies by State. (Numbers listed are for Spring 2025, and won't inflate until Fall 2025 …).**
   - ~$1119.36: Minnesota, SD, ND, and WI (reciprocity states).
   - ~$2003.13 Other states.

3. **For NDSU Students: Does Tricollege work?**
   a. Direct enrollment to MSUM, as a part-time student, always works.
   b. Registration via NDSU Tricollege will not be available for spring or summer, barring a scheduling conflict.
   c. **(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
- Achieve Online Homework
  Accessibility: https://www.macmillanlearning.com/college/us/our-story/accessibility

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 350. Organic Chemistry I. 3 Credits**. Introduction to the classification, structure, reactions, and reaction mechanisms of carbon compounds. Prerequisites: CHEM 210 (General Chemistry II).

**Instructor Description**: The course is the first semester of a fairly standard two-semester lecture course in organic chemistry. It is designed for science majors, including chemistry and biology majors, and including those preparing for health professions.

Coverage includes nomenclature, structure, properties, and the synthesis, reactions, and reaction mechanisms of alkanes, alkyl halides, alkenes, aromatics, and conjugated systems. Stereochemistry is covered. Reaction types covered include radical halogenation, $S_N2$ and $S_N1$ substitutions, E2 and E1 eliminations, addition reactions to simple alkenes and conjugated dienes, Diels-Alder reactions, and aromatic substitution reactions. Reaction mechanisms are emphasized. Synthesis design and retro-synthesis are emphasized. Structure, stability, stability-reactivity principles, acid-base chemistry, nomenclature, resonance, conjugation, and aromaticity among many other topics, are addressed.

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 not 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 20%.

**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. **Predict and explain Patterns and Properties**. Predict and explain patterns in shape, structure, bonding, hybridization, formal charge, stability, acidity, basicity, solubility, and reactivity for hydrocarbons, halocarbons, alkenes, dienes, and arenes, by understanding and applying concepts of organic chemical structure and bonding and stability.
2. **Predict reaction products**. Be able to predict products, including stereochemistry, in the reactions of alkanes, halocarbons, alkenes, dienes, and arenes.
3. **Classify, explain, and apply fundamental reactions.** Be able to recognize, classify, explain, and apply fundamental organic reactions such as $S_N2$, $S_N1$, E2, E1, alkene addition, electrophilic aromatic substitution, 1,2/1,4-additions, ring-opening, and radical halogenation. Be able to apply concepts associated with these general reaction types to product prediction, synthesis design, and reaction mechanism.
4. **Retrosynthetic analysis and Synthesis Design**. Use retrosynthetic analysis to design efficient multi-step syntheses involving halocarbons, alkenes, and arenes as intermediates or final products
5. **Draw Mechanisms.** Draw logical and detailed mechanisms for various fundamental reactions of alkanes, halocarbons, alkenes, dienes, and arenes.
6. **Apply Resonance and Conjugation.** Predict and explain patterns in stability, shape, hybridization, reactivity, and product formation when resonance or conjugation applies to a reactant, intermediate, or final product.
7. **Recognize Stereochemistry.** Classify molecules as chiral or achiral, identify chiral carbons as (R) or (S), identify relationships between pairs of molecules as enantiomers, diastereomers, or equivalent, and identify when a solution is racemic versus optically active.
8. **Apply Stability-Reactivity Principles**. Predict, explain, and rank the relative speeds of different chemical reactions by applying structure-dependent patterns in stability combined with application of mechanism recognition.
9. **Recognize Structure Relationships Between Chemicals**. Be able to recognize relationships between two chemical structures as the same structures, resonance structures, structural isomers, enantiomers, or diastereomers.
10. **Use Nomenclature**. Provide correct IUPAC names for alkanes, halocarbons, alkenes, and aromatics, including cyclic molecules and including stereochemistry.
11. **Recognize and Apply Functional Groups**. Classify organic molecules by their functional groups, and identify fundamental properties associates with those functional groups.
12. **Demonstrate Understanding in Scenarios Involving Alkanes, Alkenes, Alkyl Halides, Dienes, and Arenes.** Answer questions and explain/predict/apply physical properties, nomenclature, synthesis, reactions, mechanisms, and synthesis design/retrosynthesis to scenarios involving alkanes, alkenes, alkyl halides, dienes, and arenes.

**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 20%.

## TEST ONE SKILLS/OBJECTIVES / OUTCOMES / COMPETENCIES

| Ch | | **TEST ONE** | **Self-Assessment** (Some but not all Graded) | **Graded Assessment** |
|---|---|---|---|---|
| 1 | Structure Determines Properties | 1. Identify number of bonds and lone pairs for uncharged 2nd-row atoms<br>2. Draw and interpret Lewis, condensed, and line-angle structural formulas, including those involving double or triple bonds.<br>3. Recognize when covalent versus ionic bonding exists<br>4. Recognize and calculate formal charges and lone pairs given bond connectivity<br>5. Populate lone pairs given formal charges and bond connectivity<br>6. Identify and draw resonance structures, and use them to predict stabilities.<br>7. Use arrow-pushing to display electron movement between resonance structures<br>8. Use principles of electronegativity to predict bond polarity, predominant resonance form, anion stability, anion basicity, and acidity<br>9. Use arrow-pushing to display electron movement in chemical reactions<br>10. Identify acids and bases, and predict whether an acid-base equilibrium will favor products or reactants<br>11. Predict relative acidities and basicities based on structure, bonding, charge, electronegativity, and resonance of conjugate acid-base pairs. | 1. In-lecture in-notes problems<br>2. Practice sets online<br>3. Practice Tests<br>4. Achieve homework problems<br>5. Book practice problems | 1. Achieve homework<br>2. Quiz 1 and Quiz 2<br>3. Test 1<br>4. Final Exam |
| 2 | Alkanes and Cycloalkanes: Introduction to Hydrocarbons | 12. Predict the hybridization, electron geometry, and approximate bond angles relative to atoms in a molecule<br>13. Identify sigma versus pi bonds, and rank bond strengths<br>14. Draw 3-dimensional representation of given molecules, using the hash-wedge convention.<br>15. Identify polar and nonpolar molecules, and predict which ones can engage in hydrogen-bonding.<br>16. Predict general trends in the boiling points and solubilities of compounds, based on their size, polarity, and hydrogen-bonding ability.<br>17. Identify the classes of compounds, the "functional groups", including hydrocarbons and organic molecules containing oxygen or nitrogen, and draw structural formulas for examples<br>18. Identify when pairs of structures are related as structural isomers, stereoisomers, resonance structures, or as the same.<br>19. Correctly name alkanes and cycloalkane<br>20. Given the name of an alkane, draw the structure and give the molecular formula | 1. In-lecture in-notes problems<br>2. Practice sets online<br>3. Practice Tests<br>4. Achieve homework problems<br>5. Book practice problems | 1. Achieve homework<br>2. Quiz 2<br>3. Test 1<br>4. Final Exam |
| 3 | Alkanes and Cycloalkanes: Conformation and cis-trans Stereoisomers | 21. Use Newman projections to compare the energies of alkane conformations<br>22. Draw best and worst Newman projections relative to any individual bond<br>23. Use torsional and steric strain terminology to explain differences in rotation barriers and in Newman-projection stabilities<br>24. Identify, name, and draw cis and trans stereoisomers of di-substituted cycloalkanes<br>25. Compare the energies of cycloalkanes, and explain ring strain<br>26. Draw accurate cyclohexane chair conformation, including cis- or trans-di-substituted cases, and including "left-" and "right-handed" chair conformations<br>27. Illustrate and identify axial versus equatorial substituents on cyclohexane chairs; and predict the most stable conformations of di-substituted cases.<br>28. Based on chemical formula, identify whether an alkane is cyclic or acyclic<br>29. Given a chemical formula for an alkane, draw and name structural isomers | 1. In-lecture in-notes problems<br>2. Practice sets online<br>3. Practice Tests<br>4. Achieve homework problems<br>5. Book practice problems | 1. Achieve homework<br>2. Test 1<br>3. Final Exam |

# TEST TWO SKILLS/OBJECTIVES / OUTCOMES / COMPETENCIES

| Ch | | **TEST TWO** | **Self-Assessment** (Some but not all Graded) | **Graded Assessment** |
|---|---|---|---|---|
| 4 | Alkyl Halides and An Overview of Chemical Reactions | 1. Draw the mechanism and explain the energetics of the propagation steps in the free-radical halogenation of alkanes<br>2. Based on the selectivity of halogenation and the varying stabilities of 1º, 2º, 3º, and allylic radicals, predict the products of halogenation of hydrocarbons<br>3. Apply principles of bond strength to predict whether overall reactions or individual steps within a multi-step mechanism are exothermic or endothermic, are favorable or unfavorable, and use bond strengths to predict the energetics of reactions.<br>4. Given a rate law, predict how the rate would vary with changes in solute concentrations or solvent volume.<br>5. Use energy diagrams to discuss transition states, activation energies, intermediates, and the rate-determining step of a multistep reaction<br>6. Rank the stabilities of different radical, carbocations, or anions and describe or explain the structural features that stabilize them.<br>7. Use reactant and product stability-reactivity principles in conjunction with structural factors to compare the relative reactivities of different reactions<br>8. Predict and explain variations in bond strengths | 1. In-lecture in-notes problems<br>2. Practice sets online<br>3. Practice Tests<br>4. Achieve homework problems<br>5. Book practice problems | Achieve homework<br>Quiz 3<br>Test 2<br>Final Exam |
| 5 | Stereochemistry | 9. Classify moleculas as chiral or achiral, and identify mirror planes of symmetry<br>10. Draw a mirror image for any molecule<br>11. Identify chiral carbons, and name them using the (R) and (S) convention<br>12. Identify relationships between pairs of molecules as enantiomers, diastereomers, or equivalent<br>13. Identify and identify meso compounds<br>14. Draw all stereoisomers for a given structure<br>15. Identify when a solution is racemic versus optically active<br>16. Identify when a chemical reaction will give a racemic versus optically active product Recognize and explain how various physical properties might vary or not vary for enantiomers, or for diastereomers. | 1. In-lecture in-notes problems<br>2. Practice sets online<br>3. Practice Tests<br>4. Achieve homework problems<br>5. Book practice problems | Achieve homework<br>Quiz 4<br>Test 2<br>Final Exam |
| 6 | Reactions of Alkyl Halides; Nucleophilic Substitutions and Eliminations | 17. Correctly name alkyl halides, and identify halocarbons as 1º, 2º, 3º, allylic, vinyl, or aryl<br>18. Predict the products of $S_N2$ reactions, including stereochemistry.<br>19. Predict the products of $S_N1$ reactions, including stereochemistry.<br>20. Predict the products of E1 and E2 reactions, including stereochemistry.<br>21. Use Zaytsev's Rule to predict which structural isomer will predominate in E2 or E1 reactions.<br>22. When a halocarbon reacts, identify when $S_N2$ or E2 reactions occur, or when $S_N1$ or E1 reactions will occur, and predict the major products.<br>23. Draw mechanisms for any of $S_N1$, $S_N2$, E1, or E2 reaction<br>24. Rank the relative rates of substitutions or eliminations reactions, based on differences in substrate, base/nucleophile, leaving group, or solvent.<br>25. Predict whether a reaction will be first-order or second-order<br>26. When possible, predict predominance of substitution or elimination<br>27. Identify reactants that could product target chemical products<br>28. Design multi-reaction synthesis design sequences to convert hydrocarbons to more highly functional derivatives | 1. In-lecture in-notes problems<br>2. Practice sets online<br>3. Practice Tests<br>4. Achieve homework problems<br>5. Book practice problems | Achieve homework<br>Test 2<br>Final Exam |

## TEST THREE SKILLS/OBJECTIVES / OUTCOMES / COMPETENCIES

| | | **TEST THREE** | **Self-Assessment** (Some but not all Graded) | **Graded Assessment** |
|---|---|---|---|---|
| 7 | Alkenes: Structure and Preparation: Elimination Reactions | 1. Calculate "elements of unsaturation" ("EU") for any formula.<br>2. Determine the number of alkenes and rings present in any formula, given its chemical formula and hydrogenation information.<br>3. Draw possible structural isomers for a chemical, given formula and hydrogenation information. ("Detective" problems.")<br>4. Draw and name all alkenes with a given molecular formula<br>5. Use the E-Z and cis-trans systems to name stereoisomers<br>6. Use heats of hydrogenation to compare stabilities of alkenes, or use stability patterns for alkenes to predict heats of hydrogenation or heats of combustion<br>7. Predict relative stabilities of alkenes and cycloalkenes, based on structure and stereochemistry<br>8. Predict the products of E2-elimination for haloalkanes, reactions (Zaytsev versus Hofmann elimination), depending on whether the base used is bulky or normal.<br>9. Predict the distribution between E2-elimination and $S_N2$ substitution for reactions of haloalkanes<br>10. Predict the major alkene products (Zaytsev elimination) when alcohols undergo acid-catalyzed dehydration.<br>11. Propose and draw detailed mechanisms for E2-elimination reactions of alkyl halides, and for acid-catalyzed E1 elimination of alcohols.<br>12. Propose and design effective single-step and multistep syntheses of alkenes. (Synthesis design problems.) | 1. In-lecture problems<br>2. Practice sets online<br>3. Practice Tests<br>4. Achieve homework problems<br>5. Book practice problems | Achieve homework<br>Test 3<br>Final Exam |
| 8 | Alkenes: Addition Reactions and Other Alkene Reactions | 13. Predict the product when an alkene react with a hydrogen halides<br>14. Predict the products when alkenes react with HBr/peroxides<br>15. Predict the product when an alkene react with $H_2O/H^+$<br>16. Predict the product when an alkene undergoes hydroboration/oxidation<br>17. Predict the products when alkenes undergoes oxymercuration/demercuration<br>18. Predict the product when an alkene undergoes hydrogenation<br>19. Predict the product when an alkene reacts with $Cl_2$ or $Br_2$<br>20. Predict the product when an alkene reacts with $Cl_2$ or $Br_2$ in the present of water<br>21. Predict the product when an alkene undergoes expodiation, with or without water present<br>22. Predict the product when an alkene undergoes ozonolysis<br>23. In all of the above reactions, include effective consideration of reaction orientation (Markovnikov versus anti-Markovnikov orientation), and stereochemistry<br>24. Predict when a reaction will produce achiral versus chiral products<br>25. Predict the correct stereoisomers for stereospecific reactions.<br>26. **Draw detailed logical mechanisms** for alkene reactions with HBr, $H_2O/H^+$, $Br_2$, or $Br_2/H_2O$.<br>**27. Use retrosynthetic analysis to solve multi-step synthesis design problems involving alkenes as intermediates or final products**<br>28. Use clues provided by products of reactions such as ozonolysis to determine the structure of an unknown alkene<br>29. Determine the stereochemistry of a starting alkene, given reactants and the product stereochemistry. | 1. In-lecture problems<br>2. Practice sets online<br>3. Practice Tests<br>4. Achieve homework problems<br>5. Book practice problems | Achieve homework<br>Test 3<br>Final Exam |

## TEST FOUR SKILLS/OBJECTIVES / OUTCOMES / COMPETENCIES

| | | **TEST FOUR** | **Self-Assessment** (Some but not all Graded) | **Graded Assessment** |
|---|---|---|---|---|
| 15 | Conjugation in Alkadienes and Allylic Systems | 1. Recognize when conjugation applies, how it impacts chemical stability, and use it to predict and rank stabilities of various substances<br>2. For compounds containing nitrogen atoms, determine what the nitrogen atom hybridization and shape is; determine what the lone pair hybridization is; and predict whether the nitrogen basicity is normal or low<br>3. Predict and rank how various reactions and their reaction rates are impacted by conjugation/resonance, whether in a reactant or an intermediate or a product, for example in SN1 reactions, radical reactions or acid-base reactions<br>4. Predict the products of hydrogen halide additions to conjugated dienes.<br>5. Identify 1,2 vs 1,4 addition products in hydrogen halide additions to conjugated dienes<br>6. Identify thermodynamic versus kinetic products<br>7. Predict the products of allylic radical bromination reactions.<br>8. Draw mechanisms for addition reactons or SN1 reactions proceeding through allylic cations<br>9. Draw resonance structures for allylic cations, radicals, or anions<br>10. Predict the products of Diels-Alder reactions, including stereochemistry; and when the dienophile is disubstituted.<br>11. Identify reactants involved in Diels-Alder reactions, allylic bromination reactions, and hydrogen halide additions to conjugated dienes. | 1. In-lecture problems<br><br>2. Practice sets online<br><br>3. Practice Tests<br><br>4. Achieve homework problems<br><br>5. Book practice problems | Achieve homework<br><br>Test 4<br><br>Final Exam |
| 16 | Arenes and Aromaticity | 12. Name aromatic molecules, and draw structures given names<br>13. Use the polygon rule to draw the energy diagram for a cyclice system of p orbitals, and fill in the electrons to show whether a given compound or ion is aromatic or anti-aromatic<br>14. Use Huckel's rule to identify whether a given structure is aromatic, anti-aromatic, or non-aromatic, including heterocycles and ions<br>15. Apply understanding of how aromaticity or anti-aromaticity in a reactant, intermediate, or product impacts reactivity and reaction rates, for example in SN1 reactions or acid-base reactions<br>16. For compounds containing nitrogen atoms, determine what the nitrogen atom hybridization and shape is; determine what the lone pair hybridization is; and predict whether the nitrogen basicity is normal or low | 1. In-lecture problems<br><br>2. Practice sets online<br><br>3. Practice Tests<br><br>4. Achieve homework problems<br><br>5. Book practice problems | Achieve homework<br><br>Test 4<br><br>Final Exam |
| 17 | Reactions of Arenes: Electrophilic Aromatic Substitution | 17. Predict products for the common electrophilic aromatic substitutions: halogenation, nitration, sulfonation, alkylation, and acylation.<br>18. Predict the position of substitution involving rings that have more than one substituent.<br>19. Draw the mechanisms for the electrophilic aromatic substitution reactions.<br>20. Draw resonance structures for the cationic intermediates involved in electrophilic aromatic substitution reactions on substituted rings.<br>21. Identify and apply which substituents are electron donors and electron withdrawers; activators versus deactivators; and ortho/para directors versus meta directors for electrophilic aromatic substitution reactions.<br>22. Predict products and utilize in synthesis design problems the common aromatic support reactions: reduction of nitro groups to amino; reduction of acyl group to 1º alkyl; oxidation of alkyl groups to carboxyl; desulfonation; allylic bromination.<br>23. Retrosynthesis/Synthesis design: design syntheses towards specific aromatic targets with appropriate ortho, meta, or para subsitution, by using appropriate reactants and appropriate reaction sequencing | 1. In-lecture problems<br><br>2. Practice sets online<br><br>3. Practice Tests<br><br>4. Achieve homework problems<br><br>5. Book practice problems | Achieve homework<br><br>Test 4<br><br>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.nelson@mnstate.edu or 218-477-5869. (mnstate.edu/public-safety/).