

Chemistry 2301
Elementary Organic Chemistry I

Wednesday: 6:00-9:00 p.m.
Smith Hall 100
Fall Semester, 2019

Instructor: Professor Steven Kass, 223 Smith Hall, 625-7513 (kass@umn.edu)

Website: <http://www1.chem.umn.edu/class/2301/kass19f> (the link is available via my research website at kass.chem.umn.edu) (**not Moodle**)

Office Hours: Monday, 11:00-12:00; Wednesday, 4:00-5:00; other times by appointment.

Tutor Hours: Organic tutor hours will be held in Smith 124 throughout the semester beginning September 9th and running through finals week at the following times: Monday 10:00-1:00 & 3:00-5:00, Tuesday 9:30-11:00 & 12:00-4:00, Wednesday 10:00-12:00 & 3:00-5:00, Thursday 9:30-11:00 & 1:00-5:00, and Friday 10:00- 12:00 & 1:00-5:00. For the specific listing of individual tutors, see the our class website. It is important to me that your time is well spent in this room. Please inform me or the Head Organic TA (Casey Carpenter, carpe574@umn.edu) if tutors are not present at their scheduled time, helpful, or leave for extended periods of time. A reminder that the purpose of a tutor is to help you learn, not simply give you answers to questions or problems. The tutors are instructed to ask YOU questions that will help you understand what concept you are missing that is preventing you from solving a particular problem. Self-discovery will enhance the depth and retention of your knowledge.

OCheMConnections (formerly ChemFoundations) Program: This optional program involves the volunteer efforts of advanced undergraduate/graduate students (the **OCheMConnections Leaders**) who enjoy teaching and helping students to succeed in organic chemistry. Each OChemConnections leader will hold a weekly session at a designated time and place to work problems and review difficult concepts being taught in our 2301 and 2302 courses. These one-hour **active-learning sessions** are not meant to be lectures, office hours, or private tutoring sessions, rather facilitated group learning opportunities for maximum engagement and retention of knowledge. Attendees will be expected to participate in discussions and problem-solving activities. You are free to try-out different leaders and select one or more that best fits your learning style. Session information will be given the first week of classes and the OChemConnections program will run from September 9th to December 11th. For questions or problems, please contact Maetzin Cruz-Reyes (cruzr007@umn.edu) or Professor Jane Wissinger (jwiss@umn.edu).

Texts: "Organic Chemistry" by Francis A. Carey, Robert M. Giuliano, Neil T. Allison, and Susan L. Bane (11th ed., McGraw-Hill), "Student Solutions Manual", Molecular Model Set (optional), and Connect (electronic materials from the publisher which includes the ebook, LearnSmart and LearnSmart Prep which includes practice questions and review materials). To register for access to Connect, go to <https://connect.mheducation.com/class/s-kass-fall-2019-wednesday-evenings> and provide the requested information; you will need an access code which the bookstore should email to you. If you have trouble registering go to <https://bit.ly/StudentRegistration> information (don't buy access - the bookstore will be charging you). If you have Connect issues, please scroll to the bottom of the page and click on "Troubleshooting" in the black bar.

Exams: Four 60 minute exams [One 3" x 5" file card is permitted; model sets, calculators and other items are forbidden during tests].

Exam 1, September 25

Exam 2, October 23

Exam 3, November 13

Exam 4, December 4

Final Exam:

Wednesday, December 18, 6:00-9:00 p.m. (3 hours)

All exams including the final will be given in Smith 100. A second room is not needed at this time. Should this change, this will be announced in class and on the class website.

GRADING:

Hour Exams: 3 x 100 points (53%) or 4 x 100 points (71%)

Final Exam: 200 points (35% or 18% depending on whether 3 or 4 hourly exams are used)

Homework: 65 points (12%). For each chapter either one can do the LearnSmart reading module or the assigned problems (5) for credit. Due dates differ for the assignments (LearnSmart modules are typically due ahead of when the material will be covered in class while the problems are due just before the exams) and can be found on the Connect web page. Full marks will be given for completing each assignment on time, late homework will not be accepted.

Approximate Grading Scale: A 80–100%; B 60–79%; C 40–59%; D 30–39%; F 0–29% (minus and pluses will be used for the lower and higher ends of the specified ranges; A pluses are not given).

Final grades will be assigned based on 3 hourly exams (300 points, 53%), the final exam (200 points, 35%) and the assigned homework assignments (65 points, 12%) or 4 hourly exams (400 points, 71%), the final exam (100 points, 18%), and the assigned homework (65 points, 12%). The scheme that gives the *higher total numerical score* will be used.

MAKE-UP EXAMS WILL NOT BE GIVEN. If an hourly exam is missed, then one's grade will be determined based on the remaining 3 hourly exams as indicated above. If additional exams are missed, they will be recorded as zeros and counted as such. If the final exam is not taken and an incomplete was not arranged ahead of time, an 'F' grade will be given.

If you believe a grading error has been made, email me the nature of the problem within 10 days of the exam being returned and I will review your work and make any appropriate changes (plus or minus).

Policy for "I" Grades: Any student who does not officially withdraw or who does not satisfactorily complete the course will receive an "F" grade. As for incompletes, the policy of the Chemistry Department is that a student may request an incomplete only when (a) they have a University sanctioned excuse for missing the final exam and (b) they are passing the course based on all other graded components. Assignment of an "I" requires that the instructor and student sign a contract, available in the Departmental undergraduate office, stipulating the procedure by which the "I" grade will be made up (i.e., taking the final exam the following semester possibly from another instructor). Failure to successfully complete the procedure

outlined in the contract will result in the "I" being administratively changed by the University Registrar to an "F" or "N" (depending on the grade base) one calendar year from the end of the semester for which the "I" grade was granted.

Prerequisites for this class: A "C–" or better in Chem 1062/1066 or 1072H/1076H or equivalent.

How To Do Well In This Class

1. Come to class. Organic chemistry moves at a brisk pace and we will cover 10 chapters during the semester. To do well you need to keep up.

2. PRACTICE PRACTICE PRACTICE. Like learning a foreign language or training for a 10 K race, one must actively work at learning organic chemistry. This means that one needs to read the text, attend lectures, and do as many practice problems as one can. The more effort one puts into writing molecules and mechanisms, and doing problems, the more one will learn. In this way, the concepts will become clearer, one will begin to be able to predict chemical outcomes, and less rote learning will be needed. This makes organic chemistry interesting and even fun!

Student Conduct Code

The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community.

As a student at the University you are expected adhere to Board of Regents Policy: *Student Conduct Code*. To review the Student Conduct Code, please see: http://regents.umn.edu/sites/regents.umn.edu/files/policies/Student_Conduct_Code.pdf.

Note that the conduct code specifically addresses disruptive classroom conduct, which means "engaging in behavior that substantially or repeatedly interrupts either the instructor's ability to teach or student learning. The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities."

Use of Personal Electronic Devices in the Classroom

Using personal electronic devices in the classroom setting can hinder instruction and learning, not only for the student using the device but also for other students in the class. To this end, the University establishes the right of each faculty member to determine if and how personal electronic devices are allowed to be used in the classroom. For complete information, please reference: <http://policy.umn.edu/education/studentresp>.

Scholastic Dishonesty

You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. (Student Conduct Code:

http://regents.umn.edu/sites/regents.umn.edu/files/policies/Student_Conduct_Code.pdf) If it is determined that a student has cheated, the student may be given an "F" or an "N" for the course, and may face additional sanctions from the University. For additional information, please see: <http://policy.umn.edu/education/instructorresp>.

The Office for Community Standards has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: <https://communitystandards.umn.edu/avoid-violations/avoiding-scholastic-...>. If you have additional questions, please clarify with Prof. Kass as I can respond to your specific questions regarding what would constitute scholastic dishonesty in the context of a particular class-e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam.

Makeup Work for Legitimate Absences

Students will not be penalized for absence during the semester due to unavoidable or legitimate circumstances. Such circumstances include verified illness, participation in intercollegiate athletic events, subpoenas, jury duty, military service, bereavement, and religious observances. Such circumstances do not include voting in local, state, or national elections. For complete information, please see: <http://policy.umn.edu/education/makeupwork>.

Appropriate Student Use of Class Notes and Course Materials

Taking notes is a means of recording information but more importantly of personally absorbing and integrating the educational experience. However, broadly disseminating class notes beyond the classroom community or accepting compensation for taking and distributing classroom notes undermines instructor interests in their intellectual work product while not substantially furthering instructor and student interests in effective learning. Such actions violate shared norms and standards of the academic community. For additional information, please see: <http://policy.umn.edu/education/studentresp>.

Grading and Transcripts

The University utilizes plus and minus grading on a 4.000 cumulative grade point scale in accordance with the following:

- A 4.000 - Represents achievement that is outstanding relative to the level necessary to meet course requirements
- A- 3.667
- B+ 3.333
- B 3.000 - Represents achievement that is significantly above the level necessary to meet course requirements
- B- 2.667
- C+ 2.333
- C 2.000 - Represents achievement that meets the course requirements in every respect
- C- 1.667
- D+ 1.333
- D 1.000 - Represents achievement that is worthy of credit even though it fails to meet fully the course requirements
- S Represents achievement that is satisfactory, which is equivalent to a C- or better.

For additional information, please refer to: <http://policy.umn.edu/education/gradingtranscripts>.

Sexual Harassment

"Sexual harassment" means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For additional information, please consult Board of Regents Policy: https://regents.umn.edu/sites/regents.umn.edu/files/policies/Sexual_Harassment_Sexual_Assault_Stalking_Relationship_Violence.pdf. In this course, we strive to provide a safe and positive environment for everyone. Please review policy regarding sexual harassment and related topics: <http://regents.umn.edu/sites/default/files/policies/SexHarassment.pdf>. For support and help please contact the Aurora Center: <http://aurora.umn.edu>

Equity, Diversity, Equal Opportunity, and Affirmative Action

The University provides equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult Board of Regents Policy: http://regents.umn.edu/sites/regents.umn.edu/files/policies/Equity_Diversity_EO_AA.pdf.

We welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and nonvisible differences to this course. Instructors, teaching assistants, and peer students are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class. This is in agreement with university policy.

Disability Accommodations

The University of Minnesota views disability as an important aspect of diversity, and is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center (DRC) is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations.

- If you have, or think you have, a disability in any area such as, mental health, attention, learning, chronic health, sensory, or physical, please contact the DRC office (UM Twin Cities - [612.626.1333](tel:612.626.1333) or drc@umn.edu) to arrange a confidential discussion regarding equitable access and reasonable accommodations.
- Students with short-term disabilities, such as a broken arm, can often work with Prof. Kass to minimize classroom barriers. In situations where additional assistance is needed, students should contact the DRC as noted above.
- If you are registered with the DRC and have a disability accommodation letter dated for this semester or this year, please contact Prof. Kass early in the semester to review how the accommodations will be applied in the course. In no case should this be done with one week or less before a given exam.
- If you are registered with the DRC and have questions or concerns about your accommodations please contact your (access consultant/disability specialist).

In this course, we support anyone requiring accommodations for access to class activities and materials. Please contact the instructor or the Disability Resource Center <https://diversity.umn.edu/disability/>, which will provide a letter to share with the instructor on how to facilitate an inclusive learning environment.

Mental Health and Stress Management

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University of Minnesota services are available to assist you. You can learn more about the broad range of confidential mental health services available on campus via the Student Mental Health Website: <http://www.mentalhealth.umn.edu>.

Academic Freedom and Responsibility

Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.*

Reports of concerns about academic freedom are taken seriously, and there are individuals and offices available for help. Contact the instructor, the Department Chair, your adviser, the associate dean of the college, or the Vice Provost for Faculty and Academic Affairs in the Office of the Provost.

* *Language adapted from the American Association of University Professors "Joint Statement on Rights and Freedoms of Students".*

Multilingual Student Resources

Student English Language Support: Student English Language Support (SELS) is a free service for international undergraduate students, providing assistance in a wide array of English language skills. Students can sign up online for [one-on-one consultation appointments](#) or visit SELS in Nicholson 20.

New Resource Website for Multilingual Students: A new website to support multilingual students with their language development and communication skills: esl.umn.edu. The website includes self-study materials, practice quizzes, tips, videos, and useful links to provide English language practice with:

Speaking (participating in class, group work, discussions, and conversations and making friends), Vocabulary (academic words and informal language and slang), Reading (managing reading loads and strategies for different types of reading assignments), U.S. Culture (jokes and humor, cultural differences, social media resources, and advice to learn more about U.S. culture), and Confidence (ways to build confidence, be less nervous about mistakes, and increase fluency).

Approximate Course Schedule

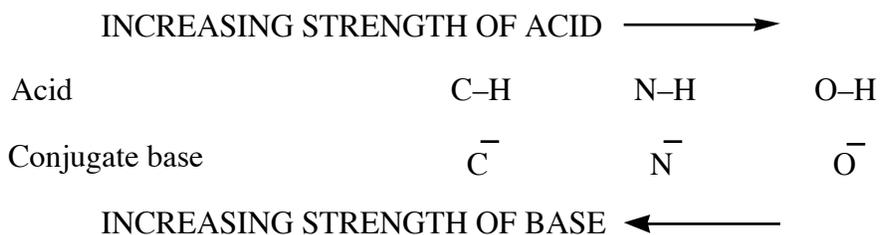
Week 1:	Introduction & Chapter 1	Structure Determines Properties
Week 2:	Chapters 1 and 2	Alkanes and Cycloalkanes: Introduction
Week 3:	Chapters 2 and 3	Alkanes and Cycloalkanes: Conformations and Stereochemistry
Week 4:	Chapter 4	Chirality
Exam 1 (September 25)		
Week 5:	Chapter 4	Chirality
Week 6:	Chapter 14	Spectroscopy
Week 7:	Chapters 14 and 5	
Week 8:	Chapter 5	Alcohols and Alkyl Halides
Exam 2 (October 23)		
Week 9:	Chapter 6	Nucleophilic Substitution
Week 10:	Chapter 7	Structure and Preparation of Alkenes: Eliminations
Week 11:	Chapter 8	Addition Reactions of Alkenes
Exam 3 (November 13)		
Week 12:	Chapters 8 and 9	Alkynes
Week 13:	Chapters 10 and 11	Introduction to Free Radicals and Conjugation in Dienes and Allylic Systems
Week 14:	Chapter 12	Arenes and Aromaticity
Exam 4 (December 4)		
Week 15:	Chapter 12	Arenes and Aromaticity & Review
Final Exam 6:00–9:00 p.m. (December 18)		

OChemConnections Leaders - this information will be provided on the class website as soon as it is available.

Acid Strength

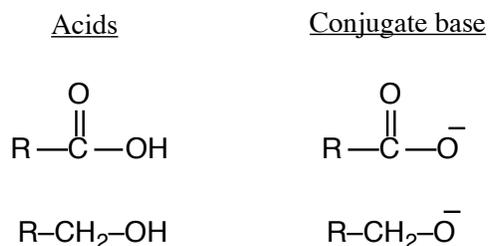
Steps To Follow For Determining Relative Acidities

1. Look for the most electronegative element which can lose a H^+ . We will primarily be concerned with C, N, and O.
2. Write the structure of the conjugate base (it will usually carry a negative charge). At this point the following broad classification can be made

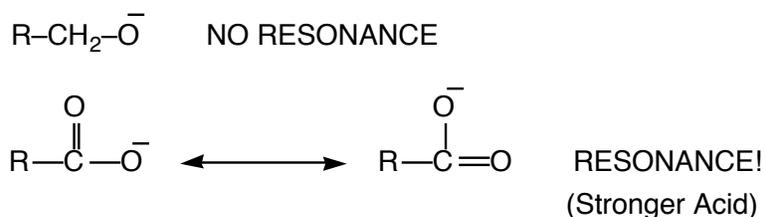


3. Look for resonance stabilization of the conjugate base. Factors stabilizing the conjugate base increase the acidity (i.e., lower the pK_a).

example:

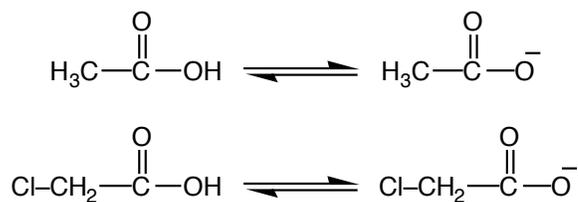


From 1 and 2 above - these two acids should be stronger than their C and N analogs.

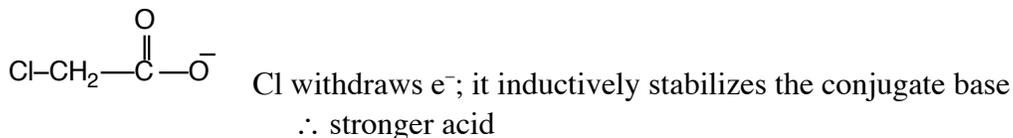


4. Look for inductive stabilization. Again charge dispersal stabilizes the conjugate base, and increases the acidity.

example:

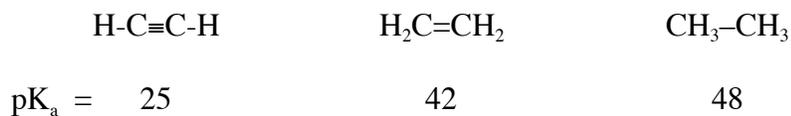


Both conjugate bases are stabilized by resonance.

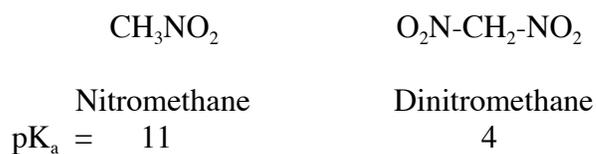
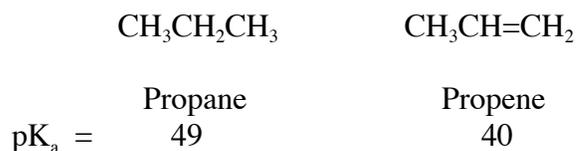
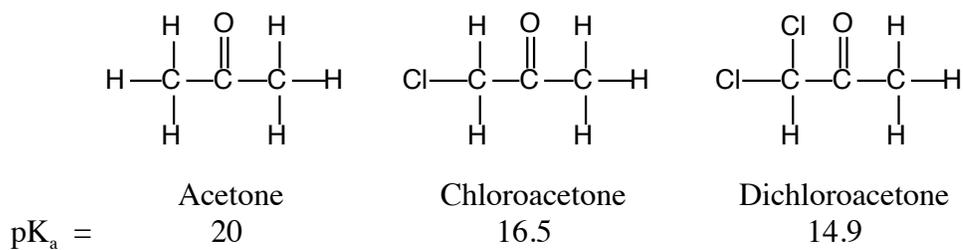


5. Look at the hybridization of the atom losing H^+ (primarily with carbanions). The more s-character in the orbital containing the extra electron, the more stable the conjugate base.

Acid strength $sp > sp^2 > sp^3$



Look at the following examples, write structures for the conjugate bases, and rationalize their pK_a using steps 1-5 (Draw resonance structures where possible).



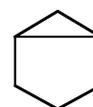
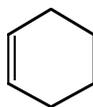
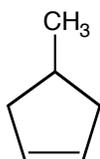
INDEX OF HYDROGEN DEFICIENCY (IHD)

IHD - The number of H atom pairs that must be removed from an alkane of molecular formula C_nH_{2n+2} to give the molecular formula of the compound of interest. If a triple bond is considered as two double bonds, the IHD gives the number of rings and double bonds in a molecule.

Example: C_6H_{10}

C_nH_{2n+2} for $n = 6$ is C_6H_{14} so $IHD = (14-10)/2 = 2$

Some possible structures for a compound of this molecular formula are:



etc.

NOTE

1. The presence of an O or S makes no difference in the index.
2. Halogens are regarded as the equivalent of a hydrogen.
3. Each N raises the number of hydrogens in the corresponding saturated parent compound by one.
4. No hydrocarbon can have an odd number of hydrogens

EXAMPLES

Structure	Formula	Parent Formula	IHD	H-Deficient Structure
	C_6H_6O	C_6H_{14}	4	3 C=C, 1 ring
	$C_3H_5NO_2$	$C_3H_9NO_2$	2	1 N=O, 1 ring
$Cl_2CHCH_2C\equiv CH$	$C_4H_4Cl_2$	$C_4H_8Cl_2$	2	2 from $C\equiv C$
	C_7H_{10}	C_7H_{16}	3	1 C=C, 2 rings
	C_9H_7N	$C_9H_{21}N$	7	4 C=C, 1 C=N 2 rings