CHEMISTRY 2810 (CHEM 303 AT UNM)

ORGANIC CHEMISTRY II

SPRING 2017

I. General Information

Instructor: Clarissa Sorensen-Unruh, M.S. Section: 101 (12-1:15pm TR in MS 301)
Office Hours+: 10:30am-12pm MW, 1:30-2:30pm MTR
Office Number: Main Campus, JS 312B Phone #: 505-224-4000 (ext. 50078)
Email: csorensen@cnm.edu Website: http://learn.cnm.edu
Twitter Handle: @RissaChem YouTube Channel: https://www.youtube.com/user/csoren1
+**Office hours are subject to change. Other office hours may be scheduled by appointment.**

II. Course Description

Introduces study of modern organic chemistry including bonding theory, structure and reactivity, physical properties and the reactions of organic compounds. Systematic examination of organic compounds based on their functional groups, including their synthesis and characterization by instrumental methods. A good background in Chemistry provides the toolkit and training needed to understand and solve some of the significant challenges we face in the fields of energy, environment and medicine. This section employs collaborative learning – in class, you will work in teams on hard problems designed to help you apply the concepts you are learning to real world problems. To succeed in this environment, you must shift your classroom persona from listener, observer and note-taker to active problem solver, contributor and discussant. **If a student does not meet the prerequisite (or corequisite) for this course, he or she may be dropped from the class at any time during the term.**
Prerequisite: CHEM 2710 and 2792

III. Essential Resources

- Access to the textbook: ***Organic Chemistry, by David R. Klein, 2nd Edition, Wiley, 2015.***
  The CNM Bookstore package should include: Hardback book and Study Guide/Solutions Manual (which is recommended).
- **Recommended:** Access to a 2nd textbook: ***Organic Chemistry: Principles and Mechanisms, by Joel Karty, 1st edition, W.W. Norton, 2014.*** Free access available through the publisher via your instructor.
- **Access to CNM Learn and CNM email:** Learning materials are delivered via CNM Learn. Important class announcements may be made to your CNM email and you should check both at least 2-3 times a week.
- **Access to Fb closed groups and WordPress blogs:** Exam reflection papers and online discussions will be administered via these websites.
- **Smartwork (SW) Access:** SW is a homework grading system that will give you the practice you need to master the concepts in organic chemistry. Homework is delivered via SW. **You can access Smartwork via the following website: http://smartwork.wwnorton.com/sw/login/index.php**
- **A molecular model kit** is highly recommended for visualizing approaches and solutions to certain spatially related course problems (e.g. stereochemistry). **You can use the model kits during major exams and quizzes.**
- **A scientific calculator** is required for this course as well. Inexpensive models may be purchased at stores such as Wal-Mart, K-Mart, Target, OfficeMax, Staples, etc. Two-line displays, such as those found in the series TI 30X II, tend to work best. **Due to their programmable functions and memory, graphing calculators will not be allowed in the 75-minute or final exams.**
- **Recommended:** Notebook and pen for note-taking before and after watching the video lectures.
- **Recommended:** Smartwork notebook which should be used to record what you have learned in SW and to make note of any problems you need to get help with.
- **Recommended:** From the first chapter covered onwards, a printed periodic table (which I have posted to CNM Learn) is VERY helpful in class.

See the appendix of this syllabus for further information about to obtain each resource.

IV. Course Learning Outcomes

Students Shall:

- Apply bonding theory to the common structural patterns encountered in organic molecules (e.g. molecular formulas*, 2-D* drawings [Lewis formulas], *3-D* structures, etc.)
- Classify organic compounds and their properties by functional group
- Use common and IUPAC rules of nomenclature to name organic compounds
- Identify, classify and understand chemical isomerism
- Study common organic reactions in terms of reactants, products, reagents, and mechanisms
- Become proficient at structural determination using spectroscopic and spectrometric data

V. Course Policy

1. ***Respect the learning environment*** and make sure your conversations on CNM Learn and on social media are related to the course material.
2. **Attendence expectations**: **I will exercise my discretion to drop you from the class after you miss 15% of class time.** Classes will begin promptly and late arrival to class or leaving early is disrespectful of your classmates. If you need to do either, please do so respectfully and discretely.
3. **Final grades**: After the drop date (**3/31/17**), you will no longer be able to drop the class and you will be assigned a letter grade A-F. Grade boundaries are set by CNM and cannot be changed. I WILL NOT change final grades unless there has been a legitimate error in my grading.
4. **Exam policy**: You will need at least one #2 pencil – exams will be partially multiple choice but mostly short answer and will administered during the class periods outlined in the class schedule. You will be provided with a periodic table and as much scratch paper as you need as well as a paper copy of the exam itself. To each midterm test, you may bring a 3" x 5" notecard with whatever information you chose handwritten on it as well as your modeling kit. No material may be stuck to the sheet. You may also need a non-programmable, non-graphing calculator for the exams if calculations are required.
5. Cheating is taken very seriously and will result in automatic and immediate consequences.
6. **Withdrawal and Grading Options Policy:** You may only change your grading option to Credit/No-Credit if the course does not apply to your major OR your minor. You should check the CNM and your possible transfer university regulations regarding Credit/No-Credit if you are considering this option.
7. **PaperCut:** PaperCut is an element of the sustainability effort at CNM. Its purpose is to reduce paper usage. Each student has an online account with an allotment of 150 free printer pages per term. If this allotment runs out, additional pages may be purchased by the student. For more information, go to the PaperCut website: http://cnm.edu/papercut.

VI. Class Structure

During class time, you will be engaged in problem-solving activities in small groups. You will have the chance to work on harder (exam type and real world application) problems with the resources of your fellow classmates, myself and your SI leader. The key components of the class are:

- **BEFORE CLASS:** Detailed pre-class reading assignments and/or video lecture assignments. Additional preparation using the 1st attempt on your SW homework is HIGHLY recommended. **If you don't do the reading and/or video watching, you will be lost in class!** Material in the reading assignments and video lectures will **NOT** necessarily be reviewed in class unless I am asked a question about it.
- **IN CLASS:** I will ask for questions at the beginning of class to give further explanation and clarification on the pre-class material. You will then work in small groups on assignments applying the material from the pre-class reading. You will be graded on your small group work individually and collectively throughout the semester via collected group work.
- **AFTER CLASS:** To deepen and fix your learning, you'll have an after-class homework assignment on Smartwork and/or on paper. **Get into the habit of doing your homework within 24 hours of watching the lecture on the topic while it is still fresh in your mind.** This will save you time and contribute to better understanding and higher grades. Use the resources available (office hours, study groups) when

you get stuck with a problem after you have given it your best effort. Expect weekly deadlines on regularly throughout the semester. You should expect to spend **at least 3-4 hours per week** on your homework.

Organic Study Habits (courtesy of Dr. Lisa Whalen at UNM):

- **Solving Problems:** Working problems is of critical importance in studying organic chemistry and is the focus of the review sessions. Most of the problems recommended in the Syllabus are of the "drill" variety. You should be certain that you can solve the recommended problems from the text, those provided in handouts, and those appearing in the practice tests**. Just understanding the answer given in the solutions manual is not enough!** If you need to look up the answer to a problem the first time you attempt it, that is fine, but you should go through the set again and again until you can **write down** the correct answer without referring to the answer book. When studying for tests, rework problems as well as reviewing your notes and the chapters in the text. You need to study the material until you can apply the principles and tools you have learned in completely unfamiliar situations.
- **Learning Reactions:** Learning organic chemistry is much like learning a foreign language. The chemical names and structures are like nouns and the reactions like verbs. As with a foreign language, it is necessary to learn the "vocabulary," so you will need to learn a significant number of reactions. As with "regular verbs" many of these fall into patterns (i.e. electron pushing) and you can figure out what might happen in an unfamiliar case by learning the pattern. As you have already seen in Chem 301, you will need to learn a significant number of reactions, and since you have already successfully completed that course, you are expected to already know those reactions as well as how to interpret spectra. Chapters 1-16 in the text were covered. For each reaction you need to learn a reactant, a reagent (or reagents and conditions) and a product. Usually the reactant can be generalized to the functional group displaying the characteristic pattern of behavior. The product can often be generalized to a newly formed functional group. The reagent patterns apply to fewer cases. Given any two of these: reactant, reagent, and product, you should be able to provide the third. **Review all of your reactions before each test**, as you will need to use previous reactions (including many from Chemistry 301) on subsequent tests.

Where to get help:

- **Ask questions** in class at any time, of your classmates or me.
- **Attend office hours** and help sessions held by me: I will provide my help sessions times on the Fb Closed Group.
- **Consider forming a study group.**
- **Consider joining the CNM Student Chemistry Society and/or attending their regular meetings on Saturdays.** (You can learn more about the chem society through the STEM UP folks: http://www.cnm.edu/depts/stemup)
- **Tweet me at @RissaChem.** Be sure to read the Twitter handout first, and **always use the hashtag #CNMCHEM2810** when you tweet so that all in the class can see your tweets. I will not respond to tweets without the appropriate hashtag.
- **Email me at csorensen@cnm.edu.** If I have not responded within 48 hours, or sooner if urgent, feel free to email me again to remind me. In busy times, emails sometimes get buried.
- **Disability Resource Center:** if you have a psychological or medical condition that may affect your performance in the class, please consider enrolling here as soon as possible. They can provide a quiet place to take the tests, additional time, as well as the possibility of a note-taker and additional services, if there is a medically documented need. For more information, go to http://www.cnm.edu/depts/disability-resource-center
- **ACE Tutoring** (the Assistance Centers for Education) is a great resource if you cannot meet me or with your SI leader during our help sessions or office hours. Many options are available and most tutoring hours are offered as a first come first served service. Please contact your SI leader for further information or visit the website: http://www.cnm.edu/depts/tutoring/ACE_Tutoring_Home.html

- **Web resources:** There is an incredible library of resources on the web (including the Khan Academy, Master Organic Chemistry, etc.). USE THEM!
- **Textbook**: the end of chapter problems in blue have answers at the back of the book. This is a great free resource.

VII. Grading

Students' grades will be calculated out of a 100 point total:

Reflection Papers (including Muddy Point Journals) (5%)

- In an effort to help students become digital citizens with appropriate professionalism online, four reflection papers (one for each exam) will be collected throughout the semester. Reflection papers will in a blog format, will be a minimum of 400 words, and will be submitted through a free account on WordPress. **Constructive and thoughtful comments on other students' blogs and/or answers for questions on the class social media can count for up to 5% of the in-class group work.**
- A muddy point journal, with a minimum of 4 muddy point questions per chapter including their answers, can used instead of the reflection papers. Muddy point journals will be collected before each exam. The muddy point question is a chance for you to tell me what was most difficult or most interesting in your assigned preparation.
- In terms of the participation in online discussion forums, you are expected to conduct yourself professionally as well as with respectful and thoughtful behavior. Quality counts! Your postings must have correct sentence structure and must be spell-checked. **Reflection papers (or muddy point journals) are graded mostly on a participation basis; if you post or submit the journal with correct grammar and spelling on time then you will receive between 80-100% for that posting or submission.**

In Class Exercises and Quizzes (10%)

- In Class Exercises will be administered via submitted group work. The group work may or may not be available after class if not completed during class.

Smartwork Homework (15% + up to 5% extra credit)

- For tutorial 'learning mode' questions, infinite attempts per question, no deductions made for incorrect answers until all attempts are used up. No penalty for using 'hints'.
- Late submissions accepted, subject to 10% penalty per day late, up to a maximum of 50% penalty. After the due date, homework assignments revert to practice problems for the rest of the semester.
- The SmartWork gradebook will be downloaded at 8am on Thursday April 27th, so no further credit can be obtained after this.
- Announced quizzes will occasionally be given in class although mostly taken home to review material prior to major exams. The lowest quiz score will be dropped. **Missed quizzes cannot be made up.**

Examinations (45%)

- Three major in-class exams will be given throughout the semester during the class periods noted in the Class Schedule.
- **There are NO make up exams; exceptions on a case-by-case basis. Make-up exams will be given in the Distance Learning and Make-Up Testing Center (http://www.cnm.edu/depts/assessment-center/distance-learning-and-make-up-testing).**
- The lowest exam will be dropped.
- All class tests will be cumulative (with up to 5 questions adapted from previous tests).

Final Exam (25%)

- It is a Math, Science, and Engineering policy that all courses require final evaluations.
- If you do not take the final exam, you will not be able to make up the missing credit for the class.

- The final exam is comprehensive but focuses mainly on the last material and has 40-ish multiple choice questions plus 1-2 short answer questions.
- If the day of the final exam is cancelled by the school (snow day, etc.), then final grades for students will be calculated based on all work completed and assessed up to that point in the course.

Grading In Summary:

Smartwork Homework	15% + up to 5% EC
(SW = Smartwork average * 0.15)	
In Class Group Exercises	10%
(ICE = In Class Group Exercises average * 0.10)	
Reflection Papers or Muddy Point Journal	5%
(R = Final reflection paper/muddy point journal grade * 0.05)	
Exams (3 75-minute, the lowest exam is dropped)	45%
(E = Exam average (best 2 of 3) * 0.45)	
ACS General Chemistry 1st Semester Final Exam	25%
(F = Final exam grade * 0.25)	

To estimate your grade at any point during the course, use the following formula:

SW + ICE + R + E + F = Course grade

100-90% = A 89.9-80% = B 79.9-70% = C 69.9-60% = D below 60% = F

VII. Tentative Lecture Schedule for Chemistry 2810, Spring 2017

Week	Klein Chapters	Lecture Topic
1	Syllabus, Review of Organic I	Review of Organic Chemistry I
2	17	Conjugated Pi Systems and Pericyclic Reactions
3	18	Aromatic Compounds
4	19	Aromatic Substitution Reactions
5	**Review for Exam 1** **Exam 1 (17-19)**	**Exam 1 will be given in class on Thursday, 2/16/17. See the Exam Policy under V. for info on what to bring, etc.**
6	20	Aldehydes and Ketones
7	21	Carboxylic Acids and Their Derivatives
8	**Review for Exam 2** **Exam 2 (20-21)**	**Exam 2 will be given in class on Thursday, 3/9/17. See the Exam Policy under V. for info on what to bring, etc.**
9	22	Alpha Carbon Chemistry: Enols and Enolates
10	23	Amines
11	**Review for Exam 3** **Exam 3 (22-23)**	**Exam 3 will be given in class on Thursday, 3/30/17. See the Exam Policy under V. for info on what to bring, etc.**
12	24	Carbohydrates
13	25	Amino Acids, Peptides and Proteins
14	26	Lipids
15	**Final Exam Review** **Comprehensive Final Exam**	**The final exam will be administered in MS 409 on Tuesday, 5/5/15, from 11:30am-1:30pm.**

The last day to drop without a grade of F or to change your grading option (letter grade, CR/NC, Audit) is **March 31st.** If you have any questions, please discuss them with your advisor. **Some changes may occur in the schedule as we proceed through the course. Changes will be announced in class and through email with myCNM and/or CNM Learn.**

IX. Appendix

1. How to get started with CNM Learn:

- Point your web browser to http://learn.cnm.edu
- Log-in using your CNM Net ID and Password.
- You *must enable pop-up windows* in order for CNM Learn to function on the computer.
- You will also *need Adobe Acrobat Reader* in order to read a lot of the files on the web site. Acrobat Reader is already installed on CNM pod computers and if you do not have it on your home computer it is a free download.
- All materials in this course fall under copyright laws and should not be downloaded, distributed, or used by students for any purposes *outside* of this course.

CNM Learn automatically records student activities, including but not limited to: your first and last access to the course, number of times you have accessed the course, and pages you have accessed. This data may be accessed by the instructor to evaluate class participation and to identify students having difficulty using Bb Learn features.

2. Calculators:

You need a scientific non-programmable calculator for exams (not a graphing calculator). IN EXAMS, YOU MAY NOT USE CALCULATORS ON CELLPHONES OR COMPUTERS. If your calculator has any of the following buttons -- PROG, PGM, CLEAR, CLR -- it is probably programmable **and will not be accepted**. If your calculator has a large screen and can graph functions, it is programmable and will not be accepted. If you are unsure, please bring your calculator into my (or the SI's) office hours before the 1st exam and I will check it for you.

A partial listing of the most important reactions from Organic Chemistry I

Addition Reactions

Markovnikov addition of HBr or HCl to alkenes and alkynes
Addition of Cl_2 or Br_2 to alkenes and alkynes
Addition of Br_2, Cl_2, or I_2 in H_2O to alkenes
Radical halogenation of alkanes: Br_2 / hv
Markovnikov hydration of alkenes with rearrangement: H_2SO_4 (or any strong H^+) and H_2O
Markovnikov hydration of alkynes: $HgSO_4$ and H_2SO_4 and H_2O
Markovnikov hydration of alkenes without rearrangement: 1. $Hg(OAc)_2$ / H_2O; 2. $NaBH_4$
Anti-Markovnikov hydration of alkenes: 1. BH_3 in THF; 2. H_2O_2 / NaOH
Anti-Markovnikov hydration of alkynes: 1. BH_3 in THF; 2. H_2O_2 / NaOH

Oxidation and Reduction Reactions

Syn-Dihydroxylation of alkenes: 1. OsO_4; 2. $NaHSO_3$ / H_2O or $KMnO_4$
Anti-Dihydroxylation of alkenes: 1. *m*-CPBA or RCO_3H; 2. H^+ / H_2O
Hydrogenation of alkenes: H_2 / Pt or Pd on C
Ozonolysis of alkenes: 1. O_3; 2. DMS or 2. H_2O_2
Dehydration of alcohols (to produce alkenes): H_2SO_4 or H_3PO_4 / heat
Hydrogenation of alkynes to *cis*-alkenes: H_2 / Lindlar catalyst
Hydrogenation of alkynes to *trans*-alkenes: Li or Na / NH_3 (l)

S_N2, S_N1, E1 and E2 reactions (Yes, they are ALL IMPORTANT!)

Example: Elimination of alkyl halides (to produce alkenes): CH_3ONa (Zaitsev product) / $(CH_3)_3COK$ (Hofmann product)

Alcohol, Epoxide and Ether Reactions

Conversion of 3° alcohols to halides: HCl or HBr
Conversion of 1° or 2° alcohols to chlorides: $SOCl_2$ / pyridine
Conversion of 1° or 2° alcohols to bromides: PBr_3 / ether
Epoxidation of alkenes: *m*-CPBA
Opening of epoxides with nucleophiles
Deprotonation of alcohols to alkoxide anions: NaH
Williamson ether synthesis: primary alkyl halide plus alkoxide anion
Reduction of aldehydes and ketones to alcohols: $NaBH_4$ or 1. LAH 2. H^+ / H2O
Oxidation of primary alcohols to carboxylic acids or secondary alcohols to ketones: $Na_2Cr_2O_7$ / H_2SO_4 / H_2O (Jones' reagent)
Oxidation of primary alcohols to aldehydes or secondary alcohols to ketones: pyridinium chlorochromate (PCC)