Chem 432, Organic Chemistry
Schedule # ****
Spring Semester 2016

Professors:	**Dr. Tom Cole**	**Dr. B. Mikael Bergdahl**
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Lecture meetings:	**MWF: 11:00-11:50, PS – 130.**	

Office Hours: **M: 9-10 am, W: 1-2 pm and appointment** **MW: 9:00-10:50 am and by appointment.**

Course Materials:

Text: **(a)** Solomons & Fryhle & Snyder*, Organic Chemistry*, 11th Ed., Wiley Publ. 2014 ISBN: 978-1-118-13357-6.
(b) Solomons, Fryhle, Snyder, *Student Guide and Solutions Manual* Organic Chemistry 11th Ed. ISBN: 978-1-118-14790-0.

Lab: B. Purse, T. Cole, M. Bergdahl, *Laboratory Manual*. (Available at Cal. Copy).

Tool: A set of molecular models, such as Prentice-Hall Molecular models, is optional but strongly recommended. Alternatively a cheaper is available from Andrus Education Supplies (see Blackboard page for details)

E-HW: Sapling Learning, Electronic homework. http://www.saplinglearning.com/

Expected Student Learning Outcomes:

a) To be able to understand physical and chemical properties of organic substances such as carbonyl compounds, amines and aromatic substances.

b) To be able to understand the chemical differences between ketones, aldehydes, and carboxylic acids and their derivatives.

c) To be able to determine bonds and hybridizations, aromaticity, and stereochemistry of simple organic carbonyl compounds.

d) To be able to depict chemical mechanisms for various organic reactions in the area of carbonyl chemistry using the curved arrow formalism.

e) To be able to mechanistically understand reduction and oxidation reactions of organic molecules.

f) To be able to determine simple structures of organic compounds based on spectroscopy using infrared (IR) and nuclear magnetic resonance (NMR).

g) To be able to see a connection and similarity between organic chemistry and the application on common “daily life” biochemical processes.

h) To be able to apply and use the outcomes above in more advanced organic chemistry courses, biochemistry, and synthetic organic chemistry.

Prerequisite: A grade of “C” or better from Chem 232 or corresponding chemistry course.
Adding Procedures: This semester we begin wait list and you will be automatically enrolled based on rankings.
Dropping Procedure: Students without a pre-req will be dropped from the course by the instructor the first week of class.

Course Structure and Conduct: The lecture course consists of three 1-hour face-to-face lectures per week. Lectures will be focused on the theoretical basis and understanding of important concepts of organic

chemistry. Power point slides will be presented and complemented with lecture board notes. You will not be penalized for not attending lectures directly, but please be aware that there is a *correlation between attendance and lower course grades in upper division organic chemistry*.

Student disabilities: If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at (619) 594-6473. To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that I cannot provide accommodations based upon disability until I have received an accommodation letter from Student Disability Services.

Course Assessment and Grading: Three midterm exams will be given on Saturdays outside the regular lecture schedule (**Feb. 13, Mar. 12, and Apr. 16**) from 10:00am - Noon. *Make sure you can take the exams on these dates before enrolling this class*!! You will be notified about the examination rooms in good time before you take the midterms. The final exam will be given on **Saturday, May 7th** from **3:30-5:30 PM** (*Group Final, see examination schedule*). No make up exams will be given. Excused absences, substantiated by an appropriate written and *signed confirmation*, will result in no penalty. Unexcused absences will result in a "zero" and will account for an "F" grade for such exam. Your TA along with the instructor will grade your midterms and final exam. ***Your course grade will be assigned at the end of the semester and will be based on a curve using a +/- assignment***. (Letter grades will be assigned for each individual exam – the +/- assignment will not be used for specific exams. There are no pre-determined guidelines for the grade distribution. Most students earn a C, but in fact, it is not too difficult to earn a higher grade in organic chemistry. The cut-off for specific grades varies, but in general an "A" accounts for >85%, a "B" >70% and a "C" around 50%. Exam scores will be posted on Blackboard. Course grades will be posted on Webportal.

The laboratory component of the grade will be based on the completion of the experiments, the reports, unknowns, products, quizzes and an evaluation of experimental technique. The laboratory grade is separate from the chem 432 grade.

Electronic Homework: Sapling Learning http://www.saplinglearning.com/
Access to Sapling is available in a bundle with the textbook from the SDSU bookstore or by purchasing an access code for ~$40 directly from Sapling Learning. The Sapling website will direct you to register for this course. eHomework will contribute a maximum of 100 points to your final grade.

Grading: Your course grade will be based on 600 points maximum and will be based on your performance on your exams.

In summary;	Midterm 1	100	points
	Midterm 2	100	
	Midterm 3	100	
	Sapling HW	100	
	Final Exam	200	
	Total	**600**	**points *(Chem 432)***

Academic Honesty: The University adheres to a strict policy regarding cheating and plagiarism. These activities will not be tolerated in this class. Become familiar with the policy (http://www.sa.sdsu.edu/srr/conduct1.html).
Any cheating or plagiarism will result in failing this class and a disciplinary review by Student Affairs.
Examples of Plagiarism include but are not limited to:

- Using sources verbatim or paraphrasing without giving proper attribution (this can include phrases, sentences, paragraphs and/or pages of work)

- Copying and pasting work from an online or offline source directly and calling it your own
- Using information you find from an online or offline source without giving the author credit
- Replacing words or phrases from another source and inserting your own words or phrases
- Submitting a piece of work you did for one class to another class

If you have questions on what is plagiarism, please consult the policy
(http://www.sa.sdsu.edu/srr/conduct1.html)
and this helpful guide from the Library:
(http://infodome.sdsu.edu/infolit/exploratorium/Standard_5/plagiarism.pdf)

Chem 432L: The laboratory component of the grade will be based on the completion of the experiments, the reports, unknowns, products, quizzes and an evaluation of experimental technique. The laboratory grade (chem 432L) is separate from the chem 432 grade.
You must attend your first scheduled lab or your spot may be forfeit!
Chem 432 Lab Crashers:
All additions after classes begin are done by wait list.

- Preference will be given to students taking Lecture and Lab concurrently.
- Students enrolled must show up for the first day of the lab.

To the student and how to succeed in Organic Chemistry (and science in general):

1. *Develop good study habits:*
   a. Attend all lectures and labs.
   b. Take good lecture notes.
   c. Use your lecture notes as a guide to your reading in the textbook. Write your questions down if there is something you don't understand. Ask your instructor if you don't understand a concept.
   d. Make flash cards of definitions, concepts, reactions, structures, and nomenclature that are in the textbook that are emphasized by your instructor in lecture. Writing something is equivalent to reading it ten times.
   e. Do all the homework problems with the aid of the study guide or answer book. The suggested problems (homework) have about the same difficulty as the problems you will be given on the exams.
   f. One of the alternative ways to learn, is to find a study partner or to form a study group and work on problems independently and then together.
   g. Keep up to date and don't fall behind.
   h. Seek course advice from science professors and students.
   i. If necessary, see your instructor or department for a tutor.
   j. Try to see the "big picture"; try to see how the topic of the week fits in with the whole course. If you have a difficulty achieving this, ask your instructor.
   k. Practice applying what you have learned in class to the world around you.
   l. Try to foster your own scientific curiosity – wonder why things are and how they happen.
   m. Put emphasis on understanding concepts rather than memorizing material.
   n. If you read the text more than 10 minutes without practicing a problem, something is wrong…..this is not how you should study organic chemistry.

2. *Have a positive attitude*.
3. *Realize that science requires more self discipline than many other majors, but actually offers more rewards*.
4. *Be organized*.
5. *Persevere and be determined to succeed*.

Good Luck in Chem 432!!

Mike Bergdahl

The Important Concepts of Organic Chemistry

For Chemistry 432

Note - not in any particular order of importance

Electronegativity and the periodic table – predictions of reactivity (nucleophilicity/electrophilicity), role of hybridizations.

pk_a – Know the basic and important compounds and the trends due to substitutents. Phenols, carboxylic acids, amines pK_b, aliphatic compounds and roles of resonance. Also, be able to relate conjugate acid and base strengths.

The octet rule and the basic structure of organic compounds.

Reaction mechanisms

1. Nucleophilic additions to carbonyl compounds (strong and weak nucleophiles)
2. Electrophilc attack
3. Aromatic electrophilic substitution
4. Free radical substitution
5. Pericylic reactions (decarboxylation, Diels-Alder, Claisen and Cope rearrangements, etc.
6. Nucleophilic substitutions, S_N1, S_N2 and S_NAr and factors that allows one to predict differences between.

Stabilities of carbocations and free radicals. Carbanions have an approximate inverse order of stability.

Stability of alkenes

Kinetic versus Thermodynamic Control of reactions

Aromaticity and antiaromaticity. Hückel's rule and application to compounds

Resonances, structures and stability

Principle of microscopic reversibility

Truisms

Don't make strong acids in basic reaction conditions and don't make strong bases in acid reaction conditions. Acidity and basicity are all relative.

The higher the reactivity the lower the selectivity and the lower the reactivity the higher the selectivity.

Tom Cole

Ithaca (a philosophical view of The Organic Chemistry)
by Constantine P. Cavafy
(1863 - 1933)

When you set out on your journey to Ithaca,
pray that the road is long,
full of adventure, full of knowledge.
The Lestrygonians and the Cyclops,
the angry Poseidon -- do not fear them:
You will never find such as these on your path,
if your thoughts remain lofty, if a fine
emotion touches your spirit and your body.
The Lestrygonians and the Cyclops,
the fierce Poseidon you will never encounter,
if you do not carry them within your soul,
if your soul does not set them up before you.

Pray that the road is long.
That the summer mornings are many, when,
with such pleasure, with such joy
you will enter ports seen for the first time;
stop at Phoenician markets,
and purchase fine merchandise,
mother-of-pearl and coral, amber, and ebony,
and sensual perfumes of all kinds,
as many sensual perfumes as you can;
visit many Egyptian cities,
to learn and learn from scholars.

Always keep Ithaca on your mind.
To arrive there is your ultimate goal.
But do not hurry the voyage at all.
It is better to let it last for many years;
and to anchor at the island when you are old,
rich with all you have gained on the way,
not expecting that Ithaca will offer you riches.

Ithaca has given you the beautiful voyage.
Without her you would have never set out on the road.
She has nothing more to give you.

And if you find her poor, Ithaca has not deceived you.
Wise as you have become, with so much experience,
you must already have understood what these Ithacas mean.

Homework problems (Solomons & Fryhle*, Organic Chemistry*, 11th Ed.).

Chapter 12, Alcohols from Carbonyl Compounds:
2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,37,38

Chapter 13, Conjugated Unsaturated Systems:
1,2,3,4,5,6,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,25,26,28,29,30,31,32,33,34,36,37,38,39,40,
41,42,43,44,45,46,50

Chapter 14, Aromatic Compounds:
2,3,4,5,6,7,12,16,17,18,19,20,21,22,23,24,25,26,27,30,31,33

Chapter 15, Reactions of Aromatic Compounds:
2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,28,29,30,31,32,33,34,35,36,37,38,39,40,
41,42,52

Chapter 16, Aldehydes and Ketones:
2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,38,41,42,
43,44,45

Chapter 17, Carboxylic Acids and Their Derivatives:
2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,18,21,22,23,24,25,26,27,28,29,30,31,32,33,35,36,37,40,41,42,44

Chapter 18, Reactions at the α Carbon of Carbonyl Compounds:
1,2,3,4,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30

Chapter 19, Condensation and Conjugate Addition Reactions of Carbonyl Compounds:
1,2,3,4,5,6,7,8,9,10,11,12,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,33,34,35,36,37,38,
39,40,41,42,43,44,45,46,47,48,49,52

Chapter 20, Amines:
1,2,3,4,5,6,9,10,11,12,13,14,17,19,21,22,23,24,25,26,27,28,29,31,34,37,43,44

Chapter 9, Nuclear Magnetic Resonance and Mass Spectrometry:
Handout

Chapter 21, Phenols and Aryl Halides:
1,2,3,4,9,10,11,12,13,14,15,17,18,19,20,22,23,24,25,27

Chapter 22, Carbohydrates:
1,2,3,4,5,7,8,9,10,11,12,20,21