Organic Chemistry I
CHM 223

Section .01 MWF 8:30 am - 9:20 am, SAC 109

Dr. Jeff Turk phone: (989) 463-7362
KSC 246 Office Hours - 9:30 am – 10-:30 am, or by appointment turk@alma.edu

Supplies (required)

Textbooks: Organic Chemistry, 8th Edition, John McMurry, 2012
Microscale Organic Laboratory, 5th Edition, Dana W. Mayo, Ronald M. Pike, and David C. Forbes, 2011
Z87 approved eye protection, Bound laboratory notebook
Small (about 1") three-ring binder

Optional Supplies

Study Guide and Solutions Manual (also on reserve in library)
Molecular Model Set

Website: http://DrTChemistry.com (follow links to Courses then CHM 223)

Office Hours: The office hours above are times during each week that I make myself available for you. If the times listed do not coincide with your availability, please let me know in class or contact me via email so we can arrange an appropriate meeting time. Among other things, please use these if you are having difficulties with the problems at the end of each chapter or with any other course material.

Tips For Success: Despite what your perception may be, this course is designed around a few simple ideas. By the time a student has finished the CHM 223/224 sequence, he or she should be able to look at an organic molecule and predict how it will react under various conditions. To begin, you will learn about molecular structure and bonding, and you will seek to answer to the most important question in chemistry; where are the electrons and where do they want to go? Most of the deficiencies that I find in students at the end of the course (this is also true in CHM 224) are related to the first couple of chapters in our textbook; these topics are foundational! The second half of CHM 223 is about organic synthesis, namely using a variety chemical reaction conditions to cause molecular change. Think of these chemical reactions as tools. These tools are nothing more than the reactants needed to turn one type of molecule into another. By the time you have finished, you will have a relatively large tool kit, and you will be able to devise rather complex schemes for making a desired product out of a given starting material. The tools are not to be simply memorized, you must also understand how they work (in part, these are called mechanisms). Otherwise, you will be devastated by too much to memorize, and you will not be able to apply these tools to important new situations (aka Exams)! In other words, mechanisms are important and must be learned and understood because they provide the detailed understanding that allows one to predict reactions, mechanisms, regiochemistry and stereochemistry. Do not memorize mechanisms, understand them by always asking yourself why each step occurs the way it does. For this class, it is expected that you will spend, on average, 8 to 12 hours per week on homework and/or working on other out of classroom assignments.

Two important keys to success in this class are (1) not falling behind, and (2) working the problems at the end of each chapter. For comparison, one who completes the latter should do far better in this course than someone whose only preparation for examinations is only reading the textbook. If you cannot work through a problem, consult your notes, text or problems earlier in the chapter to find out how to solve it; USE THE ANSWER KEY AS A LAST RESORT TO SOLVE THE PROBLEM, BUT ALWAYS USE IT TO MAKE SURE YOU'VE ANSWERED THE PROBLEM CORRECTLY! If you use the answer key as a crutch, you will fool yourself into thinking you are learning, when you are not. Here are the top 10 things to do for success in this class:

1. Never get behind, never get behind, never get behind
2. Strive to understand, not memorize the material
3. Come to class everyday.
4. Do all of the homework as soon as possible.
5. Keep up with rewriting/outlining your lecture notes and the book.
6. Keep up with updating your FGT for each new reaction.
7. Understand, do not memorize mechanisms.
8. Use the solutions manual carefully - it can become a crutch!
9. Never get behind, never get behind, never get behind
10. Strive to understand, not memorize the material

Format of Instruction: Success in this course requires that you not only know the content presented in the text, but even more importantly that you know how to apply the information you've learned. Accordingly, most of this course will be taught by working in small groups on problem-based worksheets. In part, this is the philosophy of 'flipping the classroom'. In a flipped classroom, the typical lecture and homework/problem-solving elements are reversed, whereby most instructional content happens outside of the classroom and problem-solving activities move into the classroom - though there will still be homework :-) Stay tuned in class to learn more about this.

Functional Group Transformation (FGT) Notebook (three-ring binder): The textbook presents reactions in a forward sense: A + B → C (A + B makes C), where A is the featured functional group you are changing. The retrosynthetic approach (involving the synthesis of a target compound C) mandates that you understand the reactions in a reverse sense: C ← A + B (C comes from A + B). This latter approach is how you will organize the FGT notebook; by "Reactions That Yield" (C ← A + B) where reactions will be sorted by which functional group they create.

This is designed to be an ongoing project and is your own personalized study guide. The notebook will be collected periodically and graded on completeness, organization and legibility. Although this tool will be a very useful study aid, its use will not be allowed during quizzes or exams :-(You will find this tool useful for this course, CHM 224 and also as a study aid for the MCAT, GRE and other standardized examinations. Use colors and other organizational techniques to help make this FGT notebook well organized and easy to read.

Each FGT notebook must begin with an Index; this I will provide you with, and I'll let you know which pages you should have complete after each relevant class period. Each reaction page that is entered into the FGT notebook has a specific required format (remember, this is graded). Each entry must:

- State the nature of the transformation (i.e. alkene → alcohol)
- Write the generic scheme for the reaction
- Write out the complete mechanism for the reaction
- Write out any key points regarding the reaction that were addressed in class or that are otherwise important

Examinations and Grading: There will be three examinations followed by a comprehensive final exam. The examinations will reflect material covered primarily in lecture, but as the lecture and laboratory overlap in concept, a few of the exam questions may pertain directly to the lab work. Each exam may contain one or two problems taken directly from those at the end of the textbook chapters – these should be free points for the prepared student!

Quizzes and the FGT notebooks will account for only a small portion of your grade. These are not meant to be a burden, but rather to make sure you are keeping up with the material and are not falling behind.

With exception to final exams, graded assignments that have not been retrieved 2 weeks after grading will be shredded - my office is cluttered enough :-) This syllabus is tentative and may change without notice. Re-grading requests must be made within 48 hours of receipt of the exam. Academic dishonesty will be dealt with vigorously and will result in a zero for the exam/assignment.

Three Exams (100 points each):	300 pts. (50.0%)
Comprehensive Final Exam:	100 pts. (16.7%)
Quizzes (8 quizzes @ 10 pts ea / drop lowest score):	70 pts. (11.7%)
Homework (6 @ 10 pts ea):	60 pts. (10.0%)
FGT Notebook:	20 pts. (3.3%)
Laboratory work:	50 pts. (8.3%)
Total =	**600 pts.**

Approximate Grading Scale	A	90%
	AB	88.5%
	B	80%
	BC	78.5%
	C	70%
	CD	68.5%
	D	60%
	DE	58.5%

Tentative Lecture Schedule

Date	Itinerary (Chapter)	Recommended Textbook Problems
Jan		
8, 10 , 12	Structure and Bonding (1.1 – 1.12, 2.1 – 2.3)	1.22, 1.27, 1.28, 1.29, 1.32, 1.33, 1.34, 1.36 - 1.38, 1.41, 1.42, 1.45, 1.47, 1.50, 1.51, 2.25, 2.28, 2.31
15, 17, 19	Resonance (2.4 – 2.6)	2.33 , 2.34, 2.52 - 2.55
22, 24, 26	Organic Compounds and Alkanes (Chapter 3)	3.29, 3.34, 3.35, 3.38, 3.40, 3.42, 3.44, 3.53
29	Exam 1	
31	Cycloalkanes (Chapter 4)	4.30, 4.34- 4.36, 4.42, 4.43, 4.45, 4.47 - 4.49
Feb		
2	Cycloalkanes (Chapter 4)	
5, 7, 9	Stereochemistry (Chapter 5) (in class use of model kits)	5.32, 5.36, 5.37, 5.41, 5.43, 5.44, 5.48, 5.49, 5.52, 5.56, 5.57, 5.65, 5.66, 5.73, 5.76
12, 14, 16	Acid – Base Chemistry (2.7 – 2.11)	2.36, 2.37, 2.39 - 2.41, 2.44, 2.51, 2.57
19, 21	An Overview of Organic Reactions (Chapter 6)	6.19 - 6.23, 6.27 - 6.29, 6.38, 6.39 - 6.41
23	Exam II	
Feb 25 – Mar 45	No Class – Winter Term Recess	
Mar		
5,7	Alkenes: Structure and Reactivity (Chapter 7)	7.29 - 7.32, 7.39, 7.44 - 7.46, 7.48, 7.49, 7.55, 7.56, 7.58 - 7.60
9, 12, 14, 16 19, 21, 23, 26	Alkenes: Reactions and Synthesis (Chapter 8)	8.26 (a-e), 8.27, 8.28, 8.33 - 8.35 (not c), 8.36-8.39, 8.43, 8.44, 8.48, 8.49, 8.53, 8.59, 8.61
28	Exam III	
30	Alkynes: An Introduction to Organic Synthesis (Chapter 9)	9.18, 9.19, 9.21-9.24, 9.26-9.29, 9.37, 9.43, 9.46
Apr		
2, 4, 6	Alkynes: An Introduction to Organic Synthesis (Chapter 9)	
9, 11, 13	Organohalides (Chapter 10)	10.17, 10.18, 10.20, 10.21 (a-d), 10.23, 10.28, 10.32
19 (Th)	Final Exam, 9 a.m. - 11 a.m.	

Laboratory: The laboratory portion of CHM 223 is linked to this course, and your overall grade will reflect your performance in both the lecture and laboratory component. Aside from the laboratory textbook, you must purchase a pair of safety goggles (Z87 approved) and one composition notebook for this laboratory. You must dress appropriately for lab: no open-toed shoes, shorts, or shirts with exposed shoulders. If you wish to wear shorts to lab, please bring a pair of sweatpants (or other long pants) to wear over them during class. GOGGLES MUST BE WORN AT ALL TIMES while in the lab. No food (including gum) or drinks will be allowed in the lab.

Laboratory is scheduled for a four hour period. Realize that the time needed to complete the laboratory will depend on the actual experiment and your preparedness. Absences occasioned by illness or other legitimate reasons are excused by a memo from a physician or the Dean of Student's office; unexcused absences will result in a zero and may result in failure of the course.

Laboratory Schedule

Date	Itinerary	
	LAB A - KSC 257	LAB B - KSC 261
Jan 16-19[§]	Exp 1 & 3A	Exp 27 - TLC and purification
Jan 22-25	Exp 27 - TLC and purification	Exp 1 & 3A
Jan 29-Feb 1	Exp 11B	Fractional distillation handout
Feb 5-8	Fractional distillation handout	Exp 11B
Feb 12-15	Exp 2*	Exp 4C
Feb 19-22	Exp 4C	Exp 2*
Mar 5-8	Exp 6	Exp 9*
Mar 12-15	Exp 9*	Exp 6
Mar 19-22	Multi-step synthesis handout	Exp 13
Mar 26-29	Exp 13	Multi-step synthesis handout
Apr 2-4[§]	NADH analog handout	NADH analog handout

[§] Because of MLK recognition day (January 15th), afternoon classes normally scheduled for this day will meet on FRIDAY, January 19th from 1pm until 5pm. Honor's day is scheduled for Thursday April 5th. All Thursday laboratory sections scheduled for April 5th will instead meet the following Thursday, April 12th..

* These labs will have a staggered start time. You will sign up for a start time the week prior to these experiments.

Laboratory Experiment Titles from Microscale Organic Laboratory, Fifth Edition, Dana W. Mayo, Ronald M. Pike and David C. Forbes, 2011

Exp 1 & 3A:	Melting Point Determination, Simple Distillation
Exp 2:	Preparative GC and identification by FTIR
Handout	Fractional Distillation: Separation of Hexane and Toluene
Exp 4C:	Separation of a Three Component Mixture
Exp 6:	Photochemical Isomerization (parts 6A and 6B)
Exp 9:	Dehydration of 2-Butanol/Analysis by GC
Exp 11B:	Isolation of a Natural Product
Exp 13:	Preparation of 1-Octanol
Exp 27:	Acylation of Ferrocene (TLC and purification only)
Handout	Multi-Step Synthesis of 2'-Bromostyrene
Handout	Synthesis of a working analog of an NADH