Chemistry 030-205-11 Syllabus
Organic Chemistry

Summer I 2017

Lectures: **Monday, Tuesday, Wednesday, Thursday, and Friday 9:00-11:30 AM**

Lecturer: **Professor Falzone**

Office Hours **Wednesdays 3 PM (314 Chemistry)**

Text and Molecular Model

- P. Bruice, *Organic Chemistry*, 7th ed. with solutions manual; a molecular model kit is **strongly recommended**

Problems

You will work problems during class, but more importantly, you will work them on your own. Specific homework assignments for grade will not be made. Working the problems within the chapter and at the end of the chapter is one of the best methods to learn the material and prepare for the exams. It is anticipated that you will be able to solve all the problems. The problems that develop the necessary basic skills and those that are particularly indicative of what to expect on the exams are listed at the end of the syllabus as "Suggested Problems." You are expected to do **all** of the problems within the chapter.

Course Content

For the purpose of exams, the course content is defined by (a) the lectures, (b) the relevant chapters in the text, and (c) any other specific assignments that are made. The outline and order of the topics covered is presented at the end of this handout. Please note that not all chapters will be covered in the order they are in the book. Some sections have been omitted and some will be covered at a later time. The sections that have been excluded will not be covered in the lectures, and the material will not be a part of the exams.

Grades

Your course grade is based on the following criteria:

- Three comprehensive exams, 100, 100, 100 points
- Comprehensive final exam, 150 points*

Final grades are based on performance on exams. There are no set grade lines and it is important to note that there is no set percentage of a certain grade. In fact, the entire class *can* get an "A". After each exam, you will receive some feedback as to how your numerical scores **might** translate into class grades. It is provided only to help you evaluate your own efforts and scores in the course. These indications should be treated as **rough** estimates of your final grade. Grade-lines have to be drawn somewhere, and the unavoidable consequence is that some students are just "a point" away from a higher grade. For the reason of fairness, the policy in this course is to NOT adjust students' grades in such circumstances.

*The final exam is based on 150 points. The first 100 points of the exam may be used to replace **ONE** of your midterm scores if it is higher.

Exams

- 1st exam Friday, June 9, 2017
- 2nd exam Friday, June 16, 2017
- 3rd exam Friday, June 23, 2017
- Final exam Friday, June 30, 2017

All exams will be cumulative (but they will emphasize the material covered since the previous test). They will be constructed in such a way as to emphasize active understanding of the material. To take the exam, you will need a pen or a pencil. You cannot use books, scratch paper (other than furnished), calculators, cell phones, or electronic devices of any kind including those not yet invented. You may, however, use a molecular model kit (it may not contain any written materials). If an exam is missed, it will be replaced with a comprehensive exam that will be administered during the last week of class. A valid excuse which requires written justification from an appropriate official such as a non-parent physician or the Dean of Student Life is required. **You should never take an exam if you are sick or otherwise compromised.** However, the grade for an unexcused exam will be a zero.

Regrades

Your examinations are marked according to an explicit key and set of guidelines provided by the Professors to the TAs. If you think that a question has been graded incorrectly, submit the exam to the instructor immediately after the exam was reviewed in class.

In rare instances, an addition error of points may be made; please check for these at once and report any such to the instructor *immediately* and turn in the exam.

The assignment of points and partial credit is to be considered accurate; the score you receive is not an "opening bid" in some putative haggling process. NEVER bring such issues to the Professor. In extraordinary circumstances only, a "regrade" may be entertained, subject to the following regulations:

1. The request for regrade must be submitted to the instructor by the end of lecture when the exam is returned, and must be accompanied with a written explanation of the problem. ("I think I deserved more points" is a non-starter.)
2. The **entire** exam will be regraded--this may result in no change, or a lower or a higher score. **NOTE: All exams are scanned.**

Advice: The neater and more orderly your exam, the more likely you are to receive full marks. When TAs have to hunt about for your answer, or decipher squiggles and jots, or cast about to guess at your manner of proceeding, it is more likely that the credit you receive will be lower than you might like. Therefore, fill out exam papers in an orderly and straightforward way with clear, to-the-point explanations. Practice this method of answering when writing out your homework exercises. You are encouraged to discuss chemistry and/or the course with your teaching assistant and your instructor Simple questions or comments can also be sent via e-mail. For administrative questions, see your teaching assistant.

Rules for Class Periods, Exams, and General Considerations

Organic Chemistry is a difficult course. It covers a lot of demanding material. As such, you should pay attention during lecture. Therefore, **no electronic devices are to be used in the class or during exams.** Observations made over the past few years suggest some generally useful strategies that help to improve student performance. These are summarized below, and a more extensive discussion is provided on the web.

- read the chapter material *before* the lecture
- study *every day*; do reviews weekly
- solve as many end-of-chapter problems as possible (resort to answer book only after you have attempted the problem)
- study with a friend; if you can explain a concept to your study-mate, you understand it
- just reading and understanding the material (passive understanding) is insufficient; you should be able to use the just learned concepts in situations not previously encountered, and make logical connections with concepts learned previously (active understanding)
- constantly probe your understanding by asking (and answering) the question "why?" in relation to all statements and logical constructions
- do not fall behind in your study; it is virtually impossible to prepare well for the exam in just a few days

Academic Ethics

Cheating is wrong. Cheating hurts our community by undermining academic integrity, creating mistrust, and fostering unfair competition. The university will punish cheaters with failure on an assignment, failure in a course, permanent transcript notation, suspension, or expulsion. Offenses may be reported to medical, law, or other professional or graduate schools when a cheater applies.

Violations can include cheating on exams, plagiarism, reuse of assignments without permission, improper use of the internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. Ignorance of these rules is not an excuse. Such infractions are considered cause, at the least, for awarding a "0" on the exam in question with additional sanctions that are listed above.

Working together before the exam is desired but you must complete all exams on your own. You may not have someone else take the exams for you. You may not obtain information from another student or provide information to a student about the exam either by communicating with them or looking at anything that another student has written. You may not allow another student to see anything that you have written.

On every exam, you will sign the following pledge: "I agree to complete this exam without unauthorized assistance from any person, materials, or device. [Signed and dated]" For more information, see the guide on "Academic Ethics for Undergraduates": http://e-catalog.jhu.edu/undergrad-students/student-life-policies/#Violations_of_acad

Getting Help

There are a number of mechanisms for you to get help. An important one is the Learning Den: http://academicsupport.jhu.edu/learning-den-tutoring/ . One of the teaching assistants will be available at 5 PM during the week. Office hours will be announced. Also, consider the problems solving course and forming your own study group.

Chemistry 030.205.11: Outlines of Lectures

1. Structure, Bonding & Molecular Properties (5 lectures*)

- Structure of atoms, atomic orbitals
- Chemical Bonding (ionic bonds, covalent bonds)
- Valence-bond theory (hybridization)
- Molecular Orbital (MO) theory (HOMO and LUMO)
- Resonance
- Electronegativity, dipole moments
- Acids and bases

Sections covered: 1.1 - 1.16; 2.1-2.12
Suggested problems: 1.46-1.73, 2.47-2.70

2. Alkanes (3 lectures *)

- Alkanes as building blocks (constitutional isomers)
- Functional groups
- Nomenclature
- Conformational analysis of alkanes and cycloalkanes (strain)

Sections covered: 3.1-3.15
Suggested problems: 3.52-3.58, 3.61-3.63, 3.65- 3.76, 3.78-3.79, 3.82-3.86

3. Stereochemistry (3 lectures*)

- Optical activity – enantiomers (asymmetric centers)
- Diastereomers, meso compounds,
- *R, S* Nomenclature, absolute configuration
- Fischer projections
- Chiral molecules without asymmetric centers

Sections covered: 4.1-4.16
Suggested problems: 4.53-4.67, 4.69-4.87

4. Alkenes, Overview of Organic Reaction Mechanisms, and the Addition of HX (3 lectures*)

- *Cis-trans* (*E, Z*) isomerism and degrees of unsaturation, nomenclature, structure
- Nucleophilic substitution on methyl halides, Radical chlorination of methane, Addition of HBr to ethylene
- Thermodynamics, kinetics, energy diagrams , transition states, rate-determining step
- Writing reaction mechanisms
- Hammond postulate

Sections covered: 5.1-5.12
Suggested problems: 5.37-5.39, 5.41, 5.42, 5.44-5.50, 5.52-5.58

5. Electrophilic Addition to π Bonds (5 lectures*)

- Hyperconjugation and regioselectivity (Markovnikov's rule)
- Addition of X_2 and HX to π bonds in alkenes, alkynes and dienes
- Carbocations and their rearrangements
- Preparation (mechanistic details are covered under section 8)
- Addition of halogens and water
- Hydration of the double bond
- Epoxide formation
- Catalytic Hydrogenation

Sections covered: 6.1-6.18
Suggested problems: 6.59-6.95, 6.98-6.107

6. The Reactions of Alkynes; Organic Synthesis (2 lectures*)

- Structure and Nomenclature

- Reactions of alkynes: addition of hydrogen halides, halogens, hydrogen
- Hydroboration-oxidation and acid catalyzed addition of water
- The acidity of terminal alkynes, acetylide ions, and synthesis of organic molecules

Sections covered: 7.1-7.12
Suggested problems: 7.27-7.37, 7.40-7.57

7. Conjugated Dienes and Aromaticity, (4 lectures*)

- Delocalization of Electrons (Resonance Structures)
- Benzene and Hückel's Rule
- Aromaticity and Antiaromaticity
- Electrophilic additions of dienes
- Kinetic vs. thermodynamic control
- UV and visible spectroscopy, conjugation, and the chemistry of vision
- Diels-Alder Reaction

Sections covered: 8.1-8.21
Suggested problems: 8.57-8.108

8. The Chemistry of Benzene: Aromatic Substitution Reactions and Diazonium Ions (4 lectures*)

- Halogenation, nitration, sulphonation, alkylation, acyclation
- Reactivity of the aromatic ring (substituent effects)
- Oxidations, reductions of aromatic compounds; reactions of side chains groups
- Diazonium ions, Sandmeyer reactions, and azo coupling

Sections covered: 19.1-19.23, 19.25
Suggested problems: 19.48, 19.50-19.85, 19.87, 19.88, 19.90-19.109

9. Nucleophilic Substitutions and Eliminations (5 lectures*)

- S_N1 and S_N2
- E1 and E2; E1cb
- Effects of solvent, substrate structure, and nucleophile (base) on reactivity

Sections covered: 9.1-9.9, 10.1-10.10, 11.1-11.12 (as time allows)
Suggested problems: 9.35-9.68; 10.35-10.63; 11.48-11.70, 11.72, 11.76-11.78, 11.82, 11.84, 11.89

10. Radical Reactions (3 lectures*)

- Substitution reactions of alkanes
- Radical Halogenation: Reactivity-Selectivity Principle
- Radical addition to alkenes
- Allylic bromination

Sections covered: 13.1-13.12
Suggested problems: 13.25-13.48

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*The number of lectures is approximate; adjustments may be made as necessary. A lecture = 50 minutes; Five summer lectures = 8 50 minute lectures. **All** in-chapter problems should be worked out.