

# ORGANIC CHEMISTRY (CH203) COURSE OUTLINE\*

## Fall 2013

**Instructor:** Dr. Frédéric Minassian

**Office:** room 329 – 3<sup>rd</sup> floor - building C - Department of Chemistry - 301, rue de la Chimie

**Office telephone:** 0476-514-908

**Email:** [frederic.minassian@ujf-grenoble.fr](mailto:frederic.minassian@ujf-grenoble.fr)

**Office hours:** Wednesdays (1:00-2:00 PM) in room C110 (1<sup>st</sup> floor – Building C - Dept of Chemistry) starting on week 37. Please come at the beginning of the hour.

### **Location and Meeting Times:**

☒ Lectures:

- Week 35: Thursday 29<sup>th</sup> of August 9:00-12:15 AM in room DLST-E204 (DLST building).

- Week 36: Tuesday 3<sup>rd</sup> of September 9:45-11:15 AM, Wednesday 4<sup>th</sup> of September 3:15-4:45 PM and Thursday 5<sup>th</sup> of September 8:00-9:30 AM, each of them being held in room DLST-E204.

- Week 37: Monday 9<sup>th</sup> of September 3:15-4:45 PM in room DLST-E204 and Tuesday 10<sup>th</sup> of September 3:15-4:45 PM in room DLST-F2.

- From week 38 and for the rest of the semester: Tuesday 3:15-4:45 PM in DLST-E205 and Thursday 8:00-9:30 AM in DLST-F.

No lectures on week 44 (mid-term vacations) as well as on Tuesday 5<sup>th</sup> of November.

☒ Discussion Sections:

Wednesdays 3:15-4:45 pm

Attendance at discussion sections is strongly recommended. Discussion sections will begin the week 37 (room DLST-E204 on week 37, then room DLST-D004 for the rest of the semester unless otherwise noted on the timetable).

### **Lecture Textbook and Other Course Material:**

Brown, William; Foote, Christopher; Iverson, Brent; Anslyn, Eric. *Organic Chemistry*, 6<sup>th</sup> Ed. Brooks/Cole.

Molecular models are extremely useful. Many suitable styles (*e.g.*, space-filling, ball-and-stick, framework) are available.

**Examinations:** There will be three (3) 'in class' examinations during the semester (80 min each) and a final examination (2 h). All lecture exams are cumulative. **You may drop one of the 'in class' examinations for any reason** but you may not drop the final examination. Each examination (including the final examination) is worth 100 points.

The 'in class' examinations will be held during the scheduled lecture session on the Thursday from **8:00-9:30 AM** in DLST-F at the following dates:

3<sup>rd</sup> of October 2013

7<sup>th</sup> of November 2013

28<sup>th</sup> of November 2013

The **final examination** will be held on **Thursday 12<sup>th</sup> of December 2013, 8:00-10:00 AM**

**There are no "make-up" exams - don't ask for one**

---

\* Please check the supplementary Organic Chemistry (CH203) Lab outline given by Dr. Bernard Bessières.

**Final Grades:** The final grades for both the lecture and laboratory portions of the course (CH203) are calculated by the following formula:

$$\text{Final Grade} = X1 + X2 + F + L$$

where  $X1$  and  $X2$  are the scaled scores of your two highest of three lecture exams,  $F$  is the scaled score of your final exam, and  $L$  is your lab score based on 100 points. The maximum number of points is 400.

Grade ranges are:

400	≥	A	≥	375
375	>	A-	≥	350
350	>	B+	≥	340
340	>	B	≥	310
310	>	B-	≥	300
300	>	C+	≥	275
275	>	C	≥	250
250	>	C-	≥	225
225	>	D	≥	200
200	>	F		

**Incompletes:** Incomplete grades are not accepted in this abroad program, as you will be leaving the site at the end of the semester.

**Workload:** You must plan to spend 4-5 hours per lecture hour (**12-15 hours per week**) studying organic chemistry and working on the homework problems. (To encourage you do as many homework problems as possible, the material on the quizzes and examinations will be taken occasionally from the questions in the text). This is in addition to work associated with the laboratory.

**If you need extra help:** If you need extra help in organic chemistry it is suggested that you ask questions before, after or during lectures, attend discussion and ask lots of questions and attend office hours.

**Rules for Taking Examinations, Cheating and Academic Misconduct:** We attempt to conduct our examinations in a manner that discourages cheating. Cheating is self destructive, disrespectful to your faculty and terribly unfair to your classmates. Accordingly, we have rules that govern the administration of our examinations.

#### **You are permitted to bring to the examination**

- 1) Molecular Models as long as they are contained in a **colorless and transparent** plastic bag. No paper is permitted in the bag. Nothing can be etched on the models.
- 2) Beverages in a colorless and transparent bottle.

#### **You are not permitted to bring to the examination**

- 1) Any notes or other resources.
- 2) Calculators or any other electronic or optical device.
- 3) No wrapped food.

During the examination, you must be seated orderly in every other row.

All personal possessions are to be placed at the front of the room.

Hats with visors are to be turned backwards.

There is no talking to other students or sharing of any materials such as molecular models.

If you need to go to the restroom **you must be accompanied by a teaching fellow.**

You may not start the exam late if a student has turned in his/her examination and left the exam room. If you are late, you will not be given additional time to take the test.

All other common rules of exam taking are enforced.

Any infraction is **immediately** reported to University official who then takes further action.

### **Helpful Hints:**

- 1) Keep up on the material.
- 2) Review and rewrite your lecture notes after every lecture.
- 3) Form study groups (maximum of four students).
- 4) Find problems at the end of the chapter that correspond to the lecture material.
- 5) Don't cram for exams.
- 6) Use the practice exams to see if you are prepared for the real exam.

### **Tentative Schedule of Topics from Brown-Foote-Iverson-Anslyn (6<sup>th</sup> Edition):**

The lecture notes are intended to supplement, not replace, the textbook and coming to lecture. Work the in-chapter problems pertaining to the assigned sections in the text, do as many end-of-chapter problems and problems in the on-line lecture notes as needed to gain mastery of the material.

### **I- Classical & quantum mechanical theories of bonding**

**Topics:** Electronic structure of atoms; Lewis structures; polar and nonpolar bonds; dipole moments; hybridization; molecular orbital theory of bonding; resonance; functional groups.

**Reading** 1.1-1.9

**Problems** 1.20-1.63

### **II- Conformational analysis**

**Topics:** Constitutional isomerism; condensed and bond-line (line-angle) structures; degrees of unsaturation; angle, torsional and steric strain; Newman projections; conformational analysis of acyclic and cyclic alkanes; *cis/trans* isomerism in cycloalkanes; homodesmotic reactions.

**Reading** 2.1, 2.2, 2.5, 2.6 (homodesmotic reactions are not covered in the text; refer to lecture notes); 5.1.A

**Problems** 2.16, 2.17, 2.19-2.23, 2.25, 2.32-2.34, 2.37, 2.39, 2.42, 2.45-2.48, 2.50-2.52; 5.32, 5.33(c), 5.34(d); 13.9

### **III- Stereochemistry**

**Topics** Chirality; molecular symmetry; enantiomers and diastereomers; chirality centers; the *R/S* system; *meso* compounds; optical activity; resolution of enantiomers system; the *E/Z* system.

**Reading** 3.1-3.9; 5.2

**Problems** 3.13, 3.16-3.32, 3.34-3.37; 5.15-5.18, 5.20, 5.23, 5.24, 5.33(b), 5.34(a), 5.35, 5.36; 7.7

## **IV- Spectroscopy**

**Topics** Infrared active, inactive and forbidden vibrations; factors affecting the frequency and intensity of infrared absorption; characteristic infrared absorptions of the functional groups; proton magnetic energy states; proton chemical shifts; chemically equivalent and non-equivalent protons; spin-spin splitting; coupling constants; integration; structure determination using infrared and nuclear magnetic resonance spectroscopy.

**Reading** 12.1-12.5; 13.1-13.10, 13.12

**Problems** 12.5-12.8, 12.10, 12.11; 13.15-13.18, 13.23, 13.24, 13.28

## **V- Acids and bases**

**Topics** Definition of protic and Lewis acids and bases; trends in protic acid and base strength; the concept of reaction mechanism; reaction coordinate diagrams.

**Reading** 4.1-4.7

**Problems** 4.9-4.23, 4.30-4.34, 4.38, 4.41-4.43

## **VI- Reactions of alkenes and alkynes**

**Topics** Hydrohalogenation; hydration; halogenation; halohydrin formation; hydroboration-oxidation; osmylation; ozonolysis; hydrogenation.

**Reading** 6.1-6.7

**Problems** 6.14-6.16, 6.17(a)-(f), 6.18, 6.19(a)-(d), 6.21-6.24, 6.26-6.42, 6.44, 6.45, 6.46 (omit (a)), 6.47, 6.48

## **VII- Reactions of alkynes**

**Topics** Deprotonation of terminal alkynes; hydration; reduction.

**Reading** 7.4, 7.7-7.9

**Problems** 7.8 (omit (a))-7.10, 7.11 (omit (g), (i), (j)), 7.12-7.14, 7.17, 7.21-7.23, 7.30-7.33

## **VIII- Nucleophilic substitution and elimination**

**Topics** SN1 and SN2 reactions; variables in nucleophilic substitution (leaving groups, substrates, nucleophiles); E1 and E2 reactions; competition between substitution and elimination.

**Reading** 9.1-9.10

**Problems** 9.10-9.14, 9.16-9.46, 9.47 (omit (g), (h))-9.51, 9.55(d)

## **IX- Reactions of alcohols and epoxides**

**Topics** Conversion of alcohols to sulfonates and halides; dehydration of alcohols; oxidation of alcohols; protection of alcohols; epoxidation; nucleophilic opening of epoxides

**Reading** 10.5, 10.6, 10.8; 11.6, 11.8-11.10

**Problems** 10.14, 10.24, 10.25-10.28, 10.29 (omit (g)), 10.30 (omit (g)), 10.31 (omit (f), (g)), 10.32-10.35, 10.37-10.39, 10.40 (omit (i), (j), (m)), 10.42-10.44, 10.45 (omit (a)), 10.46, 10.51 (omit (e)), 10.55; 11.15, 11.16, 11.19-11.30, 11.31 (omit (h)), 11.32, 11.33 (omit (i), (l)), 11.34 (omit (b)), 11.35-11.39, 11.42 (omit (d)), 11.44-11.