



**JOHN JAY COLLEGE OF CRIMINAL JUSTICE**  
**The City University of New York**

**CHEMISTRY 201 ORGANIC CHEMISTRY --- Fall 2012**  
**Sections 01-08**

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**Laboratory/Recitation Instructors and their contacts:**

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**Course Description**

Today's qualified forensic scientist must acquire a capacity for logical reasoning, an imaginative approach to solving problems and a flexibility that allows adaptation to a changing world. CHEM 201 aims to develop these qualities in the area of introductory organic chemistry. Goals of the course are, also, essential experimental laboratory skills and fundamental knowledge in the foundations of organic chemistry.

In particular, CHEM 201 is a systematic introduction to the chemistry of carbon compounds. It encompasses theory and reactions of hydrocarbons and functional group derivatives. Included are bonding and structure, nomenclature, stereochemistry, synthesis, mechanism, and spectroscopic analysis. The laboratory work focuses on techniques of synthesis, isolation, purification, and analysis. The laboratory component of this course consists of fourteen double-John Jay sessions over the semester. The recitations, held in a single John Jay period weekly, will be dedicated to explaining difficult topics, answering student questions, reviewing the material discussed in the lectures.

**Learning Outcomes**

*Assessed by: exams' and laboratory's performances and/or evaluation of notebook data and lab reports and/or lab tests.*

The student will demonstrate the ability to use the appropriate problem-solving techniques to solve a scientific problem such as an organic synthesis comprised of one or more steps, or a determination of the structure of a compound based on spectroscopy (IR, NMR,

MS) and/or chemical evidence.

When conducting a laboratory experiment, the student will follow written procedures commonly used in the organic lab (such as reflux, distillation, extraction, recrystallization, and melting-point determination) accurately and safely. When completing a lab report, the student will apply the scientific method correctly by being able to state a hypothesis, take careful measurements, estimate uncertainties and draw appropriate conclusions based on gathered data and scientific principles.

The student will explain observable phenomena using appropriate scientific theories, such as writing a reaction mechanism consistent with observed facts or utilizing appropriate structures to represent different types of organic molecules and species.

### **Reasoning**

- Predict the major product in an organic reaction, such as those involving hydrocarbons, alcohols, alkyl halides and alkenes
- Write synthetic schemes for the production of different classes of these compounds
- Analyze spectroscopic data to solve the structures of organic compounds.
- Perform retrosynthetic analysis
- Analyze spectroscopic data to solve the structures of organic compounds.
- Predict the optical activities and stereochemistry properties for different classes of compounds
- Analyze the structure of a given compound and predict the type of bonding, hybridization state, and effect of the structure on the physical properties of such compound.
- Draw conclusions from experimental data gathered during laboratory sessions.

### **Knowledge**

- Recognize main functional groups in organic compounds
- Name organic compounds using the IUPAC nomenclature
- Recognize nucleophiles, electrophiles and their reactivity in order to predict the course of a reaction.
- Interpret laboratory instructions, safety sheets and experimental protocols
- Define the structures and properties of organic compounds
- Describe basic organic chemistry mechanisms (SN<sub>1</sub>, SN<sub>2</sub>, E<sub>1</sub>, E<sub>2</sub> ...).
- Explain the theory behind basic spectroscopic methods
- Use appropriate current technology in the laboratory to obtain data and understand the impact that recent technologies have on the field

### **Practical skills**

- Apply basic synthetic skills
- Illustrate basic spectroscopic techniques
- Standardize and operate laboratory instruments to identify reactants and products and to separate mixtures of compounds
- Obtain information about chemical compounds from all possible sources;
- Apply this information for the safe handling, use and disposal of such compounds in a safe and environmentally responsible manner

### **Communication**

- Give small presentation on organic compounds

- Prepare laboratory reports in accordance with current forensic reports' styles

## Course prerequisites or co-requisites

ENG 101 and CHE 104

## Requirements / Course Policies

Students enrolled in this course are **required** to attend all lecture, recitation, and laboratory sessions of the section for which they registered. There are two lecture sessions, one recitation session, and one laboratory session per week. If a student needs to miss classes he/she may do so, but the instructor may ask to withdraw from the course. More than 3 absences in the labs, lectures or recitation classes will result in an unofficial withdrawal grade. The information missed is vital to your future profession. Attendance, enthusiasm, and active class participation are observed, recorded, and reflected in the student's final grade. Late arrival to the lab WILL NOT be tolerated (students will be penalized if late): such behavior has direct consequences upon the safety in the lab. Attendance is taken solely from roll sheets circulated at the beginning and/or end of each session or by the clickers. Lateness or early departure counts as ½ absence. Students missing more than 30 minutes of a session will be counted as absent. Obviously there is no penalty for students when classes are canceled.

## Required Texts

### Lecture Text:

*Organic Chemistry, 10<sup>th</sup> Edition, by Solomons, John Wiley and Sons, Incorporated 2009*

You have the flexibility of buying the book in different formats, each at different prices.

The ISBN of the cheapest version with WileyPlus is 9780470932742: this is the binder-ready version of the textbook with a WileyPLUS code.

**Do not throw away the WileyPlus registration card**, as resources found in WileyPlus will be used in class and homework will be assigned online.

### John Jay Bookstore

1.) Text with WileyPlus,

(standard version of the book packaged with WileyPlus)

2.) BinderReady Text with WileyPlus,

(3 hole punched, color pages, just like the regular book, without the binding. You can carry chapters with you to class or insert in a binder of your choice)

### **www.wileyplus.com**

3.) WileyPlus (buy directly online from [www.wileyplus.com](http://www.wileyplus.com))

(Here you do not get a physical book, just access to online ebook, all learning tools, and homework problems.)

### **Lab Manual: (The lab manual must be brought to each laboratory session.)**

*Introduction to Organic Laboratory Techniques: A Microscale Approach, 4th Edition*

*Donald L. Pavia | Gary M. Lampman | George S. Kriz | Randall G. Engel*

**Necessary for recitation and during the lecture exams:** Molecular structure models [the instructor recommend models from HGS Molecular Structure model but you are free to get different models that satisfy you].

**Other required material (to be brought to each laboratory session):**

Splash-resistant safety goggles or safety glasses meeting the ANSI Z87.1-1989 standard. All students must wear safety glasses or goggles in lab. Students requiring corrective lenses must wear safety glasses or goggles over the corrective lenses.

A non-programmable scientific calculator that can be removed from its case (available at most electronic stores).

The John Jay library (212-237-8200) owns several copies of the textbook and so does the Math and Science Tutoring Center (646-557-4595). In addition, videos have been recorded of the majority of the lecture classes for your review in case you have missed classes and are available in the Math and Science Tutoring Center.

## Grading

This course has three components -- lecture, recitation, and laboratory. Each component has a separate grading policy, which contributes a percentage to the overall course grade. In general, the course grade is the sum of the grades earned in the lecture (60%) recitation (including homework and participation during recitations: 15%) laboratory (20%) sessions and ACS exam (5%). However, since the lab sessions are an integrated component of the course, where lab safety skills and dexterity are taught for use in subsequent science courses, for safety reasons, a minimum lab grade of 60% is required to pass the course. **In order to pass the lecture portion of the course a minimum of 60% in the four lecture exams is necessary.** Unethical/unprofessional conduct will result in a failing course grade and referral for additional action.

**Lecture:** During the lecture sessions, four exams are given (each of them counts 20% of the lecture grade and last 1 hour and 05 minutes). **There are no make-up exams.** Unexcused absences from exams will result in a grade of zero. Excused absences will not lead to a penalty but remaining exams will be weighted correspondingly more. Missing three (3) exams automatically constitutes a grade of F for the course. During the final exam's week the American Chemical Society (ACS) standardized test (which lasts two hours) is given which counts as 5% of the final. It is a cumulative exam and it needs to be taken in the date dictated by the instructor (based on ACS regulations all students need to take the exam together). If a student miss the ACS standardized test in the final week of exams (with an excused absence) and he is passing the course up to that point, he will receive a grade that correspond to the average of the other four exams. If he is missing the ACS exams during the final week of exams and he is not passing the course up to that point a grade of "F" will be assigned. **THERE WILL BE NO MAKE-UPS OF THE ACS EXAM or OF ANY OTHER EXAMS.** It is important to understand that it is **students' responsibility** to come to class and take the exams. During the exams books remain closed. A non-programmable, scientific calculator may be used during exams if it is removed from its case.

**Recitation and Homework:** During the recitation sessions, students are encouraged to participate in discussions and activities related to the lecture material and homework. Active participation by all students benefits all students, providing varying approaches to mastering the subject material, incentive, and progress evaluation. Consequently, absences or failure to meaningfully participate will result in a significant course grade penalty. Students' grade will be based on the homework assigned by the recitation/lecture instructors (10%) and participation/attendances in the recitation class (5%). Students, during recitation and lecture sessions, are required to come to the board and do exercises in front of their colleagues in order to get credit for their participation. No computer-based homework will be corrected or graded if handed in a paper copy.

## Laboratory:

Pre lab questions	8-15 points	
Post lab questions	8-15 points	
Safety	5-10 points	References must be included.
Results/observations	15-25 points	All results must be clearly stated and all observations recorded.
Calculations	5-15 points	Correct units must be used. All yields must be reported. All numbers must be

		explained
Explanation/discussion/conclusion	30-50 points	This is a crucial part of the lab report. Detailed explanations of all your results and observations must be included. Your writing must be concise and easy to understand. The conclusion has to be thorough and you must demonstrate that you understood the principles of the lab.

Remember: **There is no wrong or right.** If results are different from what is expected DO NOT INVENT. Instead, try to find logical explanations for what happened. This will be taken into account and your grade will not suffer from it, as long as you provide a reasonable justification. This is the opportunity to develop your critical thinking abilities and your writing skills.

Reports written by Forensic Scientists must be clear, concise, and unambiguous. Consequently, when a question in the test/quiz/laboratory report assigned requires a written explanation, spelling, grammar, and clarity of expression will be considered in determining the “correctness” of the answer proffered. It is important that careful attention is directed to writing what you mean and meaning what you write. If the grade on the first two laboratory reports is below B, students will be referred to the Writing Center Services (212-237-8659).

**College Wide Policies for Undergraduate Courses** (see the Undergraduate Bulletin, Chapter IV Academic Standards)

**Americans with Disabilities Act (ADA) Policies**

Sample syllabus statement: “Qualified students with disabilities will be provided reasonable academic accommodations if determined eligible by the Office of Accessibility Services (OAS). Prior to granting disability accommodations in this course, the instructor must receive written verification of a student’s eligibility from the OAS which is located at L66 in the new building (212-237-8031). It is the student’s responsibility to initiate contact with the office and to follow the established procedures for having the accommodation notice sent to the instructor.”

Source: *Reasonable Accommodations: A Faculty Guide to Teaching College Students with Disabilities*, 4<sup>th</sup> ed., City University of New York, p.3.  
 ([http://www.jjay.cuny.edu/studentlife/Reasonable\\_Accommodations.pdf](http://www.jjay.cuny.edu/studentlife/Reasonable_Accommodations.pdf))

**Statement of the College Policy on Plagiarism**

Plagiarism is the presentation of someone else’s ideas, words, or artistic, scientific, or technical work as one’s own creation. Using the ideas or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations require citations to the original source.

Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism.

It is the student's responsibility to recognize the difference between statements that are common knowledge (which do not require documentation) and restatements of the ideas of others. Paraphrase, summary, and direct quotation are acceptable forms of restatement, as long as the source is cited.

Students who are unsure how and when to provide documentation are advised to consult with their instructors. The Library has free guides designed to help students with problems of documentation. (*John Jay College of Criminal Justice Undergraduate Bulletin*, <http://www.jjay.cuny.edu/academics/654.php>, see Chapter IV Academic Standards)

## Ethics

Ethics principles in chemical research will be discussed during the lecture sessions.

## Tutoring

Although a considerable amount of remediation is done during the recitation portion of the course, when necessary the Science Department generally provides -- on a first come, first served basis -- tutoring to students requesting such help at the Math and Science Tutoring Center. Scheduled weekly appointments are encouraged. "Crash" sessions immediately before a quiz or exam are discouraged. Although participation in these sessions is not required, most students find them helpful. There is no charge for tutoring.

## Course Calendars: in this order lecture, laboratory and recitation

**Last day to drop the class without academic penalty: Friday November 9<sup>th</sup>!**

SESSION	DATES	TOPICS	CHAPTER	HOMEWORK
	August-September			
1	28-August	Carbon Compounds and Chemical Bonds	1	
2	30-August	Carbon Compounds and Chemical Bonds	1	Wiley Plus
3	4-September	Hydrocarbons: Representative alkanes, etc. (no 2.15 on)	2	
4	6-September	Hydrocarbons: Representative alkanes, (no 2.15 on)	2	Wiley Plus
5	11-September	An introduction to organic reaction: Acids and bases	3	
6	13-September	An introduction to organic reaction: Acids and bases	3	Wiley Plus
7	20-September	<b>EXAM 1</b>	3	
8	27-September	Alkanes: Nomenclature, conformational analysis, etc	4	
	October			
9	2-October	Alkanes: Nomenclature, conformational analysis, etc.	4	Wiley Plus
10	04	Stereochemistry: Chiral molecules	5	
11	09	Stereochemistry: Chiral molecules	5	
12	11	Stereochemistry: Chiral molecules	5	Wiley Plus

13	16	Ionic Reactions-Nucleophilic Substitution and elimination etc	6	
14	18	Ionic Reactions-Nucleophilic Substitution and elimination etc	6	Wiley Plus
15	23	Alkenes and Alkynes I: Properties and Synthesis. Etc.	7	
16	25	Alkenes and Alkynes I: Properties and Synthesis. Etc.	7	Wiley Plus
	November			
17	30	Alkenes and Alkynes I: Properties and Synthesis. Etc.	7	
18	01	<b>EXAM 2</b>		
19	06	Alkenes and Alkynes II: Addition Reactions	8	
20	08	Alkenes and Alkynes II: Addition Reactions	8	
21	13	Alkenes and Alkynes II: Addition Reactions	8	Wiley Plus
22	15	Mass spectroscopy		
23	20	IR spectroscopy	2.15	
24	27	Nuclear Magnetic Resonance and Mass Spectrometry: Tools etc.	9	
25	29	Nuclear Magnetic Resonance and Mass Spectrometry: Tools etc.	9	
	December			
26	04	Nuclear Magnetic Resonance and Mass Spectrometry: Tools etc.	9	Wiley Plus
27	06	Radical Reaction	10	
28	11	<b>EXAM 3</b>		
FINAL WEEK		<b>ACS EXAM – NO MAKE UP EXAMS GIVEN</b>		

Tuesday	Thursday	Laboratory Experiment	Procedure Pages	Required Reading
28-Aug	30-Aug	Check - In, Lab Safety, Procedures, Glassware	n/a	Techniques 1, 2, 3, 4, 29
04-Sep	06-Sep	Exp 2A, 2C, 3A Solubility, Crystallization, Melting Point Determination	13 - 25	Techniques 8.3, 8.5, 9.2, 9.4, 9.7, 9.8, 10.1, 10.2, 11.1, 11.2, 11.3, 11.8, 11.9
11-Sep	13-Sep	Exp 4B,C,E Extraction	32 - 41	Techniques 12.1 - 12.6, 12.8 - 12.10
02-Oct	20-Sep	Exp 6B Simple and Fractional Distillation, Refractive Index Analysis	51 - 57	Techniques 14.1 - 14.3, 15.1 - 15.3, 24

09-Oct	27-Sep	<b>Exp 5A,B</b> Thin-Layer Chromatography	42 - 46	Technique 20
16-Oct	04-Oct	<b>Exp 5C</b> Thin-Layer Chromatography	46 - 48	Technique 11, 20
23-Oct	11-Oct	<b>Exp 14</b> (+) and (-) Carvones Extraction from Caraway and Spearmint	108 - 116	Techniques 7.10, 12.4, 12.9, 18
30-Oct	18-Oct	<b>Exp 15</b> (+) and (-) Carvones HPLC and IR Analysis	119 - 131	Techniques 21, 25
06-Nov	25-Oct	<b>Exp 35A</b> Oxidation-Reduction Scheme: Borneol, Camphor, Isoborneol, IR analysis	288 - 295	Techniques 7.1 - 7.4, 7.10, 8.3, 9.7, 9.8, 12.4, 25
13-Nov	01-Nov	<b>Exp 35B</b> Oxidation-Reduction Scheme: Borneol, Camphor, Isoborneol, IR analysis	295	Techniques 7.1 - 7.4, 7.10, 8.3, 9.7, 9.8, 12.4, 25
20-Nov	08-Nov	<b>Exp 21A, B</b> Nucleophilic Substitution Reactions: Competitive Nucleophiles	180 - 187	Techniques 7.2, 7.4, 7.5, 7.8, 12.5, 12.9, 12.11
27-Nov	15-Nov	<b>Exp 21A, B</b> Nucleophilic Substitution Reactions: Competitive Nucleophiles	187	Technique 22
04-Dec	29-Dec	<b>Exp 54C,H</b> Tests for Organic Substances: Unsaturation and Alcohols	466 - 469 486 - 491	Technique 10
11-Dec	06-Dec	<b>Lab Final</b> , Check out	n/a	Review all materials
<b>Tuesday</b>	<b>Thursday</b>	<b>Laboratory Experiment</b>	<b>Procedure Pages</b>	<b>Required Reading</b>

**Last day to drop the class without academic penalty: Friday November 9<sup>th</sup>!**

TUESDAY	THURSDAY	MATERIAL TO BE REVIEWED
28-Aug	30-Aug	Carbon compounds and chemical bonds
04-Sep	06-Sep	Hydrocarbons: representative alkanes, etc.
11-Sep	13-Sep	An introduction to organic reaction: Acids and bases
02-Oct	20-Sep	Alkanes: nomenclature, conformational analysis, etc
09-Oct	27-Sep	Alkanes: nomenclature, conformational analysis, etc

16-Oct	04-Oct	Stereochemistry: chiral molecules
23-Oct	11-Oct	Ionic reactions-nucleophilic substitution and elimination
30-Oct	18-Oct	Ionic reactions-nucleophilic substitution and elimination
06-Nov	25-Oct	Alkenes and Alkynes I: Properties and Synthesis.
13-Nov	01-Nov	Alkenes and Alkynes II: Properties and Synthesis.
20-Nov	08-Nov	IR spectroscopy
27-Nov	15-Nov	Nuclear Magnetic Resonance and Mass Spectrometry: Tools etc.
04-Dec	29-Nov	Nuclear Magnetic Resonance and Mass Spectrometry: Tools etc.
11-Dec	06-Dec	Radical Reaction