CITY COLLEGES of CHICAGO
Harry S Truman
Education that Works

Harry S Truman College
Master Syllabus
Chemistry 207 Organic Chemistry II
Active IAI Code CHM 914

1. **Title, Number, and Classification**
   Organic Chemistry II
   073-0207-1

2. **Course Term**
   16 week Semester or 8 week summer term

3. **Credit and Contact Hours**
   Credit hours: 6
   Contact hours: 4 lecture; 4 laboratory

4. **Prerequisites**
   Grade of C or better in Chemistry 205 (Organic Chemistry I) or consent of the department chairperson

5. **Catalog Description**
   Continuation of the study of organic chemistry: alcohols, aldehydes and ketones, carboxylic acids, functional derivatives of carboxylic acids, O, N and S containing compounds, heterocyclic compounds, spectroscopy; laboratory emphasis on organic synthesis and spectroscopic analysis. Writing assignments, as appropriate to the discipline, are part of the course.

6. **Students for whom the course is intended**
   This is a course required for students majoring in chemistry, biochemistry, chemical technology; students who are in pre-pharmacy, pre-medicine, pre-dentistry, pre-optometry, physicians assistant, and some engineering undergraduate programs.

7. **Course Objectives**
   The broad objectives of this course are to:
   - Develop students' ability to demonstrate and communicate their understanding of the fundamental principles of organic chemistry, its applications, and its relationship to other disciplines
   - Develop the students' ability to integrate various technologies in collecting, recording, analyzing, evaluating, and presenting data and information
   - Create in the students a culture of safety and integrity in the conduct of their laboratory experiments and in the manner in which they gather, interpret, analyze, and evaluate data
   - Engage the students in proposing logical solutions to current, unresolved problems relevant to individuals/society using the knowledge and skills acquired in the course
   - Foster student engagement in their own learning
   - Develop process skills that help the students become more competitive in the job market

8. Learning Outcomes

Upon completion of this course, students should be able to:

- Integrate chemical reasoning into an understanding about the world around them and the challenges of society.
- Solve advanced problems in organic chemistry using chemical concepts such as structural analysis, mechanistic theory, spectroscopic analysis, and elements of synthesis.
- Manipulate chemicals in the laboratory to achieve multi-step synthesis, purification, and analysis of complex organic molecules.
- Collect, record, graph, chart, analyze, and interpret data obtained from experimentation.
- Communicate, in oral and written form, an understanding of organic chemical concepts as applied to complex molecules.

Specific Student Learning Outcomes

At the completion of this course, the successful student should be able to:

1. Write the names and structural formulas for organic compounds containing the following functional groups: alcohols, thiols, amines, aldehydes, ketones, acids and acid derivatives, heterocycles, carbohydrates, amino acids and proteins, lipids, and nucleic acids.
2. Identify and define structural features of alcohols, thiols, amines, aldehydes, ketones, acids and acid derivatives, heterocycles, carbohydrates, amino acids and proteins, lipids, and nucleic acids and how these influence the physical properties of these compounds.
3. Draw or construct model structures of alcohols, thiols, amines, aldehydes, ketones, carboxylic acids and acid derivatives, heterocycles, carbohydrates, amino acids and proteins, lipids, and nucleic acids in three dimensions and as three dimensional representations.
4. Predict the regiochemistry and stereochemistry of organic reactions involving addition to ketones, aldehydes, and carboxylic acid derivatives; oxidation and reduction; nucleophilic aromatic substitution; rearrangements; enol condensations; cycloadditions.
5. Illustrate the mechanisms of organic reactions involving addition to ketones, aldehydes, and carboxylic acid derivatives; oxidation and reduction; nucleophilic aromatic substitution; rearrangements; enol condensations; cycloadditions using curved arrow notation.
6. Predict and rationalize potential reaction pathways for major and minor products in organic reactions using kinetics, thermodynamics, and neighboring group effects.
7. Use chemical principles to explain the physical and biological properties of lipids, carbohydrates, amino acids, proteins, nucleotides, DNA and RNA.
8. Explain the catalytic activity of selected enzymes using structural and mechanistic principles.
9. Document the relevant reactions in the multi-step synthesis of biologically relevant organic compounds.
10. Use NMR, IR, MS, and UV-Vis spectroscopy to determine the structure of organic compounds.
11. Demonstrate increased proficiency in standard laboratory techniques.
12. Perform laboratory experiments that illustrate basic chemical principles and using advanced equipment and instrumentation.
13. Analyze and identify simple biological molecules through chemical and spectroscopic techniques.
14. Perform chemical reactions involving the functional groups listed above.
15. Safely prepare organic compounds using multi-step synthesis.
16. Safely handle organic compounds in the laboratory.
17. Maintain a laboratory notebook through the careful recording of observations and experimental data.
18. Consistently practice articulated laboratory safety and hygiene protocols.

19. Demonstrate effective laboratory procedures such as transfer of solids, weighing of solids, pouring of liquids, measurement of liquid volume.
20. Collect, record, organize, and graph experimental data.
21. Interpret and analyze experimental data and draw inferences from it.
22. Summarize the results of experimental observations and data.

9. Topical Course Outline (suggested)

- Review of structures, properties, and reactions from Organic Chemistry I
- Alcohol and Phenols
- Ethers, Epoxides, and Thiols
- Aldehydes and Ketones
- Amines
- Carboxylic Acids
- Carboxylic Acid Derivatives
- Enols and Enolates
- Biological Molecules (lipids, proteins, carbohydrates, nucleic acids)
- Synthetic and Biological Polymers

Suggested Calendar

Date	Lecture Topic/Lab Activity
Week 1	Introduction and Review of Organic Chemistry I Laboratory Orientation and check-in
Week 2	Alcohols and Phenols Review of Organic Laboratory Techniques
Week 3	Ethers, Epoxides, and Thiols; Lab 1: Synthesis of Triphenylmethanol
Week 4	Aldehydes and Ketones; Lab 2: Identification of Aldehydes and Ketones
Week 5	Aldehydes and Ketones; Lab 3: Friedel-Crafts Acylation
Week 6	EXAM 1 Amines
Week 7	Carboxylic Acids; Lab 4 Esterification
Week 8	Functional Derivatives of Carboxylic Acids;
Week 9	Enolate Anions and Enamines Lab 5: Aldol Condensation
Week 10	C-C Bond Formation and Synthesis; Lab 6: Diels Alder Reaction
Week 11	EXAM 2 Carbohydrates; Lab 7: Preparation of Benzoin
Week 12	Lipids; Lab 8: Preparation of Benzil
Week 13	Amino Acids and Proteins; Lab 9: Preparation of Benzilic Acid
Week 14	Nucleic Acids; Lab 10: Preparation of Sulfanilamide

Week 15	EXAM 3; Final Exam Review; Laboratory check-out
Week 16	FINAL EXAM

10. Texts and Materials (suggested)

Organic Chemistry, 6th ed., by W.H. Brown, C.S. Foote, and B.L. Iverson, Brooks/Cole **2011**. The older 5th or 4th editions are acceptable.
Laboratory Notebook: ***National Notebook 43-375*** or similar
Optional: ***Molecular Modeling Kit***; the 68845NV Chemistry Molecular Model Set from www.indigo.com would suffice.

11. Methods of Instruction

Lectures, Discussions, and Notes: Lecture outlines and notes will be available on Blackboard.

Laboratory Activities: Students are expected to have reviewed the experimental procedures before coming to class. Some of these may be guided inquiry laboratory activities. Prelab sheets are due at the beginning of the lab period.

Group Exercises/Chem Activities: Guided inquiry learning activities, some chapter exercises

Class Demonstrations: Live demonstrations of chemical and physical processes may be done during both the lecture and lab; students are expected to record these and their observations

Video clips: Certain laboratory techniques, hazardous reactions, and processes may be shown through short video clips.

Laboratory Demonstration Videos:
Microscale Technique 3: Recrystallization
Microscale Technique 4: Solvent Evaporation
Microscale Technique 5: Distillation
Microscale Technique 7: Extraction
Microscale Technique 8: Physical Constanta (including melting points)
Microscale Technique 9: Chromatography (including column chromatography)

http://bcs.wiley.com/he-bcs/Books?action=resource&bcsId=5405&itemId=0471215023&resourceId=19612

Online Activities: Discussions, especially among group members, outside of class through Blackboard Discussion Board or other electronic means agreed upon by the group is encouraged.

12. Methods of Evaluation:

Final course grades will be based on the following:

Class Participation	5%	90 – above	A
Lab	25%	80 – 89	B
Quizzes	25%	66 – 79	C
Long Exams	25%	50 – 65	D
Final Exam	20%	below 50	F
Total	100%		

***A student needs to pass both the lecture and laboratory portions in order to pass CHEM 207. A failing average in either one at the end of the term will mean a grade**

of “F” for the course.

Class Participation: Student participation in class discussion and group activities, including completed problem-solving exercises, and attendance will determine the class participation score.

Exams/Quizzes: The long exam with the lowest score and the two quizzes with the lowest scores will not be included in calculating the final grade.

Lab: Each lab is worth 25 points. The lowest lab score will be dropped. The score will be based on proper conduct during lab (i.e., application of correct lab techniques and observance of lab safety and hygiene), satisfactory completion of the experiment, reasonable results, and prompt submission of the formal report or report sheets. Refer to the list below (and the checklist on Blackboard) for instructions related to the lab reports.

Authorized Signature and File

Date: _____