

This syllabus is provided as a general informational guide. Some of the information may vary depending on the specific course section and instructor. Different sections of the same course may require different textbooks. Verify the section specific textbook information in the CUNY's Academic Course Schedule Web Page. Modifications of the grading system presented here will be communicated by the instructors of the sections when they meet the class.

BOROUGH OF MANHATTAN COMMUNITY COLLEGE
The City University of New York
Department of Science

Title of Course: Organic Chemistry I

Class Hours: 3

Course Code: CHE 230

Laboratory Hours per Week: 4

Semester:

Instructor Information (Phone#, Office#, email) _____

Credits: 5

Course Description

This two-semester course sequence is the study of the structure and properties of the fundamental classes of organic compounds with emphasis on reactivity, reaction mechanism, stereochemistry, electronic theory and applications to allied fields.

Basic Skills: ACR 094, ENG 088 or ESL 054, and MAT 051

Prerequisites/Corequisites: MAT 056 CHE 201 and CHE 202.

Corequisites _____

Course Student Learning Outcomes (Students will be able to...)	Measurements (means of assessment for student learning outcomes listed in first column)
<p>1. Understand and recognize the following Organic Chemistry concepts</p> <ul style="list-style-type: none">• Structure and bonding. Hybridization and the structure of saturated and unsaturated hydrocarbons.• Polar Covalent Bonds and their relationship to Brønsted-Lowry and Lewis Acids and Bases.• Resonance.• Conformational analysis of alkanes and cycloalkanes.• Addition, elimination, substitution, and rearrangement reactions.• Structure, reactivity, reactions and synthesis of alkanes, alkenes, and alkynes.• Stereochemistry of enantiomers, diastereomers, and meso compounds.	<p>1. Examinations, homework assignments and laboratory experiments</p>

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<ul style="list-style-type: none"> • Structure, reactivity, and synthesis of alkyl halides. • Nucleophilic substitution and elimination reactions of alkyl halides. • Synthetic organic techniques for the building of small and large molecules and to show their relationship with biological structures. • Organic laboratory techniques and skills to synthesize, separate, purify and characterize organic compounds. 	
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Below are the college's general education learning outcomes, the outcomes that are checked in the left-hand column indicate goals that will be covered and assessed in this course. (Check at least one.)

	General Education Learning Outcomes	Measurements (means of assessment for general education goals listed in first column)
<input type="checkbox"/>	Communication Skills- Students will be able to write, read, listen and speak critically and effectively.	
X	Quantitative Reasoning- Students will be able to use quantitative skills and the concepts and methods of mathematics to solve problems.	To record experimental data and to use to plot graphs and calculate reactant concentrations, limiting reagents, theoretical yield and percentage yields%
X	Scientific Reasoning- Students will be able to apply the concepts and methods of the natural sciences.	Exam questions, homework assignment, laboratory assignments and case study
<input type="checkbox"/>	Social and Behavioral Sciences- Students will be able to apply the concepts and methods of the social sciences.	
<input type="checkbox"/>	Arts & Humanities- Students will be able to develop knowledge and understanding of the arts and literature through critiques of works of art, music, theatre or literature.	
<input type="checkbox"/>	Information & Technology Literacy- Students will be able to collect, evaluate and interpret information and effectively use information technologies.	
<input type="checkbox"/>	Values- Students will be able to make informed choices based on an understanding of personal values, human diversity, multicultural awareness and social responsibility.	

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Required Text

1. Organic Chemistry, 3rd Ed by David Klein, John Wiley & Sons, Inc., 2017

ISBN 978-1-119-31615-2

Other Resources (Highly recommended)

1. Student Study Guide and Solutions Manual by David Klein, Edition binder ready version, ISBN: 978-1-119-42253-2 John Wiley & Sons, Inc., 2017.

2. A small Scale Approach to Organic laboratory Techniques , 3rd Ed. by Donald Pavia, Gary Lampman, George Kriz and Randall Engel, Brooks/Cole Cengage Learning, 2011 ISBN-13: 978-1-4390-4932-7 and ISBN-10: 1-4390-4932-

3. Lab coats or aprons

4. Molecular modeling kit

Evaluation and Requirements of Students

The laboratory will be evaluated in preparation, work, and report. A student who is absent from more than one laboratory session seriously jeopardizes his/her grade for the course.

The students are encouraged to work as many problems found at the end of the chapter until the main content of the chapter is mastered. The use of the molecular models is recommended to visualize the stereochemistry and the three-dimensional aspect of the organic compounds. The *Student Study Guide and Solutions Manual* is useful for checking your answers.

Outline of Topics

Chapter	Lecture Topics
1 1.1 to 1.13	A Review of General Chemistry: Electrons, Bonds, and Molecular Properties The Structural Theory of Matter. Electrons, Bonds, and Lewis Structures. Formal Charges. Induction and Polar Covalent Bonds. Atomic Orbitals. Valence Bond and Molecular Orbital Theory. Hybridized Atomic Orbitals. VSEPR. Dipole Moments and Polarity. Intermolecular Forces and Physical Properties. Solubility.
2 2.1 to 2.13	Molecular Representations Molecular Representations. Bond-Line Structures. Functional Groups. Formal Charges. Lone Pairs. Three-Dimensional Structures. Resonance. Curved Arrows. Formal Charges in Resonance Structures. Drawing Resonance Structures via Pattern Recognition. Assessing Relative Importance of Resonance Structures. Resonance Hybrid. Delocalized and Localized Lone Pairs.

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- 3 Acids and Bases**
3.1 to 3.9 Bronsted-Lowry Acids and Bases, Acidity. Flow of Electron Density: Curved Arrow Notation. Position of Equilibrium and Choice of reagents. Levelling Effects. Solvating Effects. Counterions. Lewis Acids and Bases.
- 4 Alkanes and Cycloalkanes**
4.1 to 4.15 Alkanes: Introduction, Nomenclature, Constitutional Isomers, Relative Stability of Isomers, Sources and Uses. Newman Projections. Conformational Analysis of Ethane, Propane, and Butane. Cycloalkanes: Conformations, Monosubstituted and Disubstituted. Cyclohexane: Conformations, cis-trans Stereoisomerism. Polycyclic Systems.
- 5 Stereoisomerism**
5.1 to 5.11 Isomerism. Stereoisomerism. Configuration Using the Cahn-Ingold-Prelog System. Optical Activity. Enantiomers and Diastereomers. Symmetry and Chirality. Fischer Projections. Conformationally Mobile Systems. Resolution of Enantiomers. *E* and *Z* Designations.
- 6 Chemical Reactivity and Mechanism**
6.1 to 6.12 Enthalpy. Entropy. Gibbs Free Energy. Equilibria. Kinetics. Energy Diagrams. Nucleophiles and Electrophiles. Arrow Pushing. Drawing Curved Arrows. Carbocation Rearrangements. Reversible and Irreversible reaction arrows.
- 7 Alkyl Halides: Nucleophilic Substitution and Elimination Reactions**
7.1 to 7.13 Introduction to Substitution and Elimination Reactions. Nomenclature and uses of Alkyl Halides. SN2 Reactions. E2 Reactions. Nomenclature and stability of alkenes. Regiochemical and Stereochemical Outcomes for E2 Reactions. Unimolecular reactions. Kinetic Isotope Effects in Elimination reactions. Predicting Products: Substitution vs. Elimination. Substitution and Elimination Reactions with Other Substrates. Synthetic Strategies.
- 8 Addition Reactions of Alkenes**
8.1 to 8.14 Introduction to Addition Reactions. Addition vs. Elimination. Hydrohalogenation. Acid-Catalyzed Hydration. Oxymercuration-Demercuration. Hydroboration-Oxidation. Catalytic Hydrogenation. Halogenation and Halohydrin Formation. *Anti* and *Syn* Dihydroxylation. Oxidative Cleavage. Predicting Products of an Addition Reaction. Synthesis Strategies.
- 9 Alkynes**
9.1 to 9.11 Alkynes: Introduction, Nomenclature, Preparing, Reduction, Hydrohalogenation, Hydration, Halogenation, Ozonolysis. Acidity of Acetylene and Terminal Alkynes. Alkylation of Terminal Alkynes. Synthesis Strategies.

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10	Radical Reactions
10.1 to 10.10 And 10.13	Radicals. Radical Mechanisms. Chlorination of Methane. Halogenation: Thermodynamic Considerations , Regioselectivity, and Stereochemistry. Allylic Bromination. Autooxidation and Antioxidants. Halogenation as a Synthetic Technique.

Experiments:

Experiment Title	Week
Laboratory Safety and Laboratory Rules, Check-in	1
Melting Point Determination	2
Purification of Acetanilide	3
Simple and Fractional Distillation	4
Conformers of Alkanes and Cycloalkanes	5
Isolation and Purification of Caffeine	6
	7
Synthesis and Purification of Acetaminophen	8
Oil of Cinnamon	9
	10
Synthesis of Cyclohexene	10
	11
SN1/SN2 reactions	12
Synthesis of Butyl Bromide	13
	14
Check out	15

Class Participation

Participation in the academic activity of each course is a significant component of the learning process and plays a major role in determining overall student academic achievement. Academic activities may include, but are not limited to, attending class, submitting assignments, engaging in in-class or online activities, taking exams, and/or participating in group work. Each instructor has the right to establish their own class participation policy, and it is each student's responsibility to be familiar with and follow the participation policies for each course.

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BMCC is committed to the health and well-being of all students. It is common for everyone to seek assistance at some point in their life, and there are free and confidential services on campus that can help.

Single Stop www.bmcc.cuny.edu/singlestop, room S230, 212-220-8195. If you are having problems with food or housing insecurity, finances, health insurance or anything else that might get in the way of your studies at BMCC, come by the Single Stop Office for advice and assistance. Assistance is also available through the Office of Student Affairs, S350, 212-220-8130.

Counseling Center www.bmcc.cuny.edu/counseling, room S343, 212-220-8140. Counselors assist students in addressing psychological and adjustment issues (i.e., depression, anxiety, and relationships) and can help with stress, time management and more. Counselors are available for walk-in visits.

Office of Compliance and Diversity www.bmcc.cuny.edu/aac, room S701, 212-220-1236. BMCC is committed to promoting a diverse and inclusive learning environment free of unlawful discrimination/harassment, including sexual harassment, where all students are treated fairly. For information about BMCC's policies and resources, or to request additional assistance in this area, please visit or call the office, or email olevy@bmcc.cuny.edu, or twade@bmcc.cuny.edu. If you need immediate assistance, please contact BMCC Public safety at 212-220-8080.

Office of Accessibility www.bmcc.cuny.edu/accessibility, room N360 (accessible entrance: 77 Harrison Street), 212-220-8180. This office collaborates with students who have documented disabilities, to coordinate support services, reasonable accommodations, and programs that enable equal access to education and college life. To request an accommodation due to a documented disability, please visit or call the office.

BMCC Policy on Plagiarism and Academic Integrity Statement

Plagiarism is the presentation of someone else's ideas, words or artistic, scientific, or technical work as one's own creation. Using the idea 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. Students who are unsure how and when to provide documentation are advised to consult with their instructors. The library has guides designed to help students to appropriately identify a cited work. The full policy can be found on BMCC's Web site, www.bmcc.cuny.edu. For further information on integrity and behavior, please consult the college bulletin (also available online).