SYLLABUS

DATE OF LAST REVIEW: 02/2013
CIP CODE: 24.0101
SEMESTER: Departmental Syllabus
COURSE TITLE: Organic Chemistry I
COURSE NUMBER: CHEM-0211
CREDIT HOURS: 3
INSTRUCTOR: Departmental Syllabus
OFFICE LOCATION: Departmental Syllabus
OFFICE HOURS: Departmental Syllabus
TELEPHONE: Departmental Syllabus
EMAIL: Departmental Syllabus

KCKCC-issued email accounts are the official means for electronically communicating with our students.

PREREQUISITES: College Chemistry II and Lab, CHEM-0112

REQUIRED TEXT AND MATERIALS: Please check with the KCKCC bookstore, http://www.kckccbookstore.com for the required text for your particular class.

COURSE DESCRIPTION:
The course covers aliphatic and aromatic compounds with emphasis on organic reactions and reaction mechanisms, nomenclature, stereoisomerism, and spectroscopy. Students should enroll in Organic Chemistry Laboratory CHEM-0213 at the same time.

METHOD OF INSTRUCTION: A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations, projects and presentations, speeches, debates, and panels, conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.
COURSE OUTLINE:
I. Introduction
   A. Definitions of organic chemistry terms
   B. Review of general chemistry concepts
      1. Electron-dot formulas
      2. Quantum mechanics
      3. Bonding
      4. Acids and Bases
II. Alkanes
   A. Structure
   B. Quantum mechanical (QM) treatment
   C. Nomenclature: Structural Isomerism
   D. Conformational Isomerism
   E. Optical Isomerism
   F. Preparation of Alkanes
   G. Reactions of alkanes
III. Alkenes
   A. Nomenclature
   B. The double bond: QM description
      1. Consequences of the double bond
      2. Cis/Trans isomerism
   C. Preparation of Alkenes
   D. Reactions of alkenes
      1. Addition
      2. Hydroboration
   E. Allylic vs vinyl
   F. Dienes
IV. Alkynes
   A. Nomenclature
   B. The triple bond: QM description
   C. Preparation of Alkynes
   D. Reactions of alkynes
      1. Substitution Reactions
      2. Addition Reactions
V. Cyclic Hydrocarbons (aliphatic)
   A. Baeyer Strain Theory
   B. Theory of the puckered ring
   C. Cyclohexane
1. Chair-boat conformations
2. Axial-equatorial substituents
3. Cis-trans isomerism
D. Reactions of cycloalkanes

VI. Benzene (aromatic cyclic compounds)
   A. History
   B. Resonance
   C. QM description of aromaticity
   D. Preparation of benzene
   E. Reactions of benzene
   F. Substituted benzene compounds
      1. Activating & deactivating substituents
      2. Ortho-para & meta directors
      3. The Friedel-Crafts Reaction

VII. Alcohols and Ethers
   A. Nomenclature
   B. Physical properties
   C. Preparation of Alcohols and Ethers
   D. Reactions of Alcohols and Ethers

VIII. Spectroscopy
   A. Electromagnetic Radiation
   B. Mass Spectroscopy
   C. Infrared Spectroscopy
   D. Nuclear Magnetic Resonance
      1. $^1$H NMR
      2. $^{13}$C NMR
   E. Ultra-Violet Spectroscopy

**EXPECTED LEARNER OUTCOMES:**

A. The student will be able to demonstrate a scientific framework of organic chemistry knowledge in the areas of aliphatic compounds, aromatic compounds, organic reactions and mechanisms, organic nomenclature, and stereochemistry.

B. The student will be able to demonstrate a working knowledge of the fundamental concepts of organic chemistry to allow further study of chemistry.

C. The student will be able to demonstrate a working knowledge of instrumentation used in organic chemistry.
COURSE COMPETENCIES:

The student will be able to demonstrate a scientific framework of organic chemistry knowledge in the areas of aliphatic compounds, aromatic compounds, organic reactions and mechanisms, organic nomenclature, and stereochemistry.

1. The student will be able to define various functional groups: alkanes, alkenes, alkynes, cyclic hydrocarbons, aromatic hydrocarbons, halocarbons, and alcohols.
2. The student will be able to identify various functional groups: alkanes, alkenes, alkynes, cyclic hydrocarbons, aromatic hydrocarbons, halocarbons, and alcohols.
3. The student will be able to illustrate various functional groups: alkanes, alkenes, alkynes, cyclic hydrocarbons, aromatic hydrocarbons, halocarbons, and alcohols.
4. The student will be able to demonstrate the ability to name and draw structures of chemical compounds possessing those functional groups.

The student will be able to demonstrate a working knowledge of the fundamental concepts of organic chemistry to allow further study of chemistry.

5. The student will be able to predict the outcome of organic reactions involving these functional groups under given reaction conditions.
6. The student will be able to draw and show scientifically valid reaction mechanisms of organic chemical reactions.
7. The student will be able to demonstrate the ability to outline syntheses of simple organic compounds.
8. The student will be able to define pertinent thermodynamic and kinetic parameters associated with conformational analysis and chemical reactions.
9. The student will be able to illustrate pertinent thermodynamic and kinetic parameters associated with conformational analysis and chemical reactions.
10. The student will be able to discuss pertinent thermodynamic and kinetic parameters associated with conformational analysis and chemical reactions.
11. The student will be able to define quantum mechanical theory to discuss the nature of chemical reactivity.
12. The student will be able to illustrate quantum mechanical theory to discuss the nature of chemical reactivity.
13. The student will be able to utilize quantum mechanical theory to discuss the nature of chemical reactivity.
14. The student will be able to illustrate resonance and resonance structures.
15. The student will be able to discuss resonance and resonance structures.
16. The student will be able to draw chiral compounds.
17. The student will be able to identify chiral compounds.
18. The student will be able to illustrate chiral compounds.
19. The student will be able to identify and define chiral.
20. The student will be able to identify and define racemate.
21. The student will be able to identify and define enantiomer.
22. The student will be able to identify and define diastereomer.
23. The student will be able to identify and define stereoselective.
24. The student will be able to identify and define stereospecific.
25. The student will be able to identify and define dextrorotatory.
26. The student will be able to identify and define levorotatory.
27. The student will be able to identify and define (R), (S).
28. The student will be able to identify and define meso-isomers.

The student will be able to demonstrate a working knowledge of instrumentation used in organic chemistry.
The student will be able to demonstrate an ability in theory and practice of modern instrumental methods of analysis including ultraviolet spectroscopy, infrared spectroscopy, and gas chromatographic mass spectrometry (GC/MS).

**METHOD OF INSTRUCTION:** This course will have lectures as primary tools for instruction. Laboratory experiments will serve to reinforce, supplement, and provide a context for materials presented in lectures. Other instruction methods, such as videos, demonstrations, and discussions may be utilized.

**ASSESSMENT OF LEARNER OUTCOMES:** The student will be evaluated by means of classroom participation, homework problems, exams, quizzes, and the final exam.

**SPECIAL NOTES:**
This syllabus is subject to change at the discretion of the instructor. Material included is intended to provide an outline of the course and rules that the instructor will adhere to in evaluating the student’s progress. However, this syllabus is not intended to be a legal contract. Questions regarding the syllabus are welcome any time.

Kansas City Kansas Community College is committed to an appreciation of diversity with respect for the differences among the diverse groups comprising our students, faculty, and staff that is free of bigotry and discrimination. Kansas City Kansas Community College is committed to providing a multicultural education and environment that reflects and respects diversity and that seeks to increase understanding.

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Kansas City Kansas Community College complies with the Americans with Disabilities Act. If you need accommodations due to a documented disability, please contact the Director of the Academic Resource Center, in Rm. 3354 or call at: 288-7670.