Ohio Articulation Number (OAN)
Course Submission Form
2005-2006

College/University: Lakeland Community College

Course(s) Submitted (Title & Course #): CHEM 2600 Organic Chemistry
Ohio Articulation Number: OSC 010

Date: February 1, 2006 Course: 2 of a 2 Course OAN mapping.

Name and title of individual submitting on behalf of the college/university:
Name: Marilyn S. Jones Title: Associate Provost
Address: Kirtland, Ohio 44094
E-mail: mjones@lakelandcc.edu
Phone: (440) 525-7828
Fax: (440) 525-7657

Credit Hours: 5 qtr
Lecture Hours: 3
Laboratory Hours: 6 (if applicable)
Pre-Requisites(s): CHEM 2500

Placement Score (if applicable):
(Name of test) (Score)

Catalog/Course Description (Includes Course Title and Course #):
CHEM 2600 Organic Chemistry II: This course continues the organic chemistry sequence. It emphasizes organic synthesis, structure determination, stereochemistry, spectroscopy, reaction mechanisms, and the use of the chemical literature. It covers
aldehydes, ketones, carboxylic acids, amines, amides, esters, polymers, fats, amino acids, carbohydrates and proteins. Students will study nucleophilic acyl substitution, nucleophilic addition, carbanions, and polymerization mechanisms. Related laboratory experience emphasizes more advanced synthetic and analytical procedures, using both macro and micro techniques. This course is intended for chemistry majors and chemical technician, pre-medical, pre-dental, and pharmacy students.

Texts/Outside Readings/Ancillary Materials
Organic Chemistry by Bruice; Intro to Organic Lab Tech: Small Scale Appr by Pavia

Course Objectives and/or Plan of Work

GENERAL COURSE GOALS:

1. Further develop the foundation in the fundamental principles and concepts in organic chemistry begun in CHEM 2500.

2. Further develop students' problem-solving abilities in both theoretical material and in the laboratory setting.

3. Further develop strategies that emphasize the processes of science and scientific thinking as related to organic chemistry at the macro and molecular level.

4. Further develop students' ability and speed in the handling and manipulation of chemical equipment in the organic laboratory.

5. Demonstrate the relationships between theoretical concepts, practical applications and laboratory investigations.

6. Provide students with the opportunity to further develop group skills through participation in group laboratory experiences.

COURSE OBJECTIVES:

Upon completion of the course, the student should be able to:

1. Describe the interrelationships of the major functional groups in terms of their structure and their physical (b.p., solubility) chemical (oxidation, reduction, acidity, basicity) special (IR and NMR) properties.
2. Interconvert major functional groups into other major functional groups. (Synthesize molecules) for example, convert alkenes to alcohols, alcohols to aldehydes, aldehydes to acids, acids to amides, amides to esters, esters to acids.

3. Identify, write, use, interpret and apply the following reaction mechanisms: electrophilic aromatic substitution, electrophilic addition, free radical substitution, free radical addition, nucleophilic substitution, nucleophilic acyl substitution, nucleophilic addition, condensation reactions, free radical, anionic and cationic polymerization reactions, oxidations and reductions using chemical and catalytic pathways.

4. Outline synthetic pathways using the following reactions: Grignard Reagents, Hydroboration, Williamson synthesis, enolate anions, Aldol and Claisen condensations, acetoacetic ester and malonic ester synthesis and phase transfer catalyst.

5. List and organize carboxylic acids in order of strength.

6. List and organize amines in order of strength.

7. Describe and distinguish between and synthesize polymers.

8. Identify and draw the structure for, and give an application for, the following molecular types: Polymer, steroid, fat, oil, wax, carbohydrate, protein, soap, detergent, amino acid, polypeptide, nucleic acid, fatty acid, terpene.

9. Demonstrate proficiency in the use of the following laboratory techniques/laboratory instruments:
   a. Notebook keeping
   b. Recrystallization
   c. Simple and Fractional distillation
   d. Vacuum distillation
   e. Rotary evaporation
   f. Paper, thin layer, column and gas chromatography
   g. Heating and cooling techniques
   h. Extractions
   i. Synthesis set up and product analysis
   j. Yield calculations and yield interpretation
   k. IR instrument operation and spectral interpretation
   l. NMR instrument operation and spectral interpretation
   m. Micro laboratory synthesis
   n. Written and oral report preparation and presentation
   o. Use of the chemical literature including chemical abstracts online.

10. Demonstrate cooperative investigative skills in the laboratory.
Description of Assessment and/or Evaluation of Student Learning

INSTRUCTIONAL PROCEDURES THAT MAY BE UTILIZED:
Lecture, including discussion and problem solving sessions.
A.V. and demonstrations as needed.
Frequent handouts to supplement text.
Laboratory work to learn lab skills and to apply lecture theory.
Student presentations along with student generated topic summaries will
also be a part of the lecture class.

SUGGESTED GRADING PROCEDURES:

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<tr>
<td>Exams</td>
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<td>150</td>
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<td><strong>TOTAL</strong></td>
<td><strong>1650</strong></td>
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</table>

Master Syllabi and Working Syllabi (if both are used)

LAKELAND COMMUNITY COLLEGE - COURSE OUTLINE FORM

ORIGINATION DATE: 08/02/99 APPROVAL DATE: 02/13/01
LAST MODIFICATION DATE: 08/30/01 EFFECTIVE TERM/YEAR: FALL 2001

TEX:

01/04/06
COURSE NUMBER: CHEM2600
COURSE TITLE: Organic Chemistry II

<table>
<thead>
<tr>
<th>OBR MAX CREDITS: 5.00</th>
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<tbody>
<tr>
<td>LECTURE 3.00</td>
</tr>
<tr>
<td>CONTACT HOURS: 3.00</td>
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PREREQUISITES:
CHEM2500

PROGRAMS & CERTIFICATES FOR WHICH THIS COURSE IS REQUIRED:
NONE
PROGRAMS & CERTIFICATES FOR WHICH THIS COURSE IS AN ELECTIVE:
   3701 - Chemical Technician Certificate
   9000 - Associate of Arts-Transfer
   9099 - TRANSFER MODULE
   9100 - Associate of Science-Transfer

COURSE ACCEPTED AS TRANSFER CREDIT BY:

RECOMMENDED CLASS SIZE: 16        RATIONALE: LAB SIZE

FREQUENCY OF OFFERING: 1 X YEAR
TERMS NORMALLY OFFERED: SPRING

LAB FEE: 39.00

RATIONALE FOR COURSE:
This course is a continuation of CHEM 2500 Organic Chemistry I and completes a full year of organic chemistry for students who need transfer credit in chemistry, biology, chemical engineering or for a pre-medical tract.

COURSE DESCRIPTION:
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COURSE OUTLINE:

I. Alcohol and Thiols
   A. Structure, Nomenclature, Properties and Uses
   B. Acidity and Basicity
   C. Synthesis: Grignard and Reduction Reactions, Hydroboration
   D. Reactions: Halogenation, Dehydration and Oxidation

II. Ethers, Sulfides and Epoxides
   A. Structure, Nomenclature, Properties and Uses
   B. Synthesis and Reactions
   C. Crown Ethers
   D. Mass Spectrometry
   E. Background and Interpretation

III. Aldehydes and Ketones
   A. Synthesis and Analysis
   B. Nucleophilic Addition Reactions
   C. Biological Applications
IV. Carboxylic Acids
   A. Acidity vs. structure
   B. Synthesis
   C. Reactions

V. Carboxylic Acids Derivatives
   A. Amides, Esters, Anhydrides, Halides, Nitriles
   B. Nucleophilic Acyl Substitution
   C. Biologic and Biochemical Examples
   D. Biopolymers

VI. Carbonyl Alpha-Substitution Reactions
   A. Keto-Enol Tautomerism – Enolate Anions
   B. Alpha hydrogen Reactions
   C. Hell-Volhard-Zelinski Reaction
   D. Carbonyl Condensation Reactions: Aldol, Claisen, and Michael
   E. Biological and Biochemical applications
   F. Acetoacetic Ester and Malonic Ester Synthesis

VII. Aliphatic Amides
   A. Amine Basicity
   B. Synthesis and Reactions
   C. Phase Transfer Agents

VIII. Organic Polymer Chemistry
   A. Polymers: structure, nomenclature, properties
   B. Step-growth polymerization
   C. Chain-growth polymerization
   D. Unique polymers with unique properties

IX. Biomolecules: Carbohydrates
   A. Classification
   B. Synthesis
   C. Acetals and Hemi Acetels
   D. Moni, Di and Polysaccharides

X. Biomolecules: Lipids
   A. Fats, Waxes, Oils (Triglycerides)
   B. Terpenes
   C. Steroids
   D. Soaps and Detergents

XI. Biomolecules: Amino Acids, Peptides and Proteins
   A. Structures and Zwitterions
   B. Synthesis of Alpha Amino Acids
   C. Peptide Synthesis and Hydrolysis; Polypeptides
   D. Protein structure and Denaturation

XII. Biomolecules: Heterocyclics
   A. Heterocyclics
   B. Nucleic Acids
   C. DNA and RNA – structures and properites

XIII. The Organic Chemistry of Metabolism
   A. Glycolysis and Beta-Oxidation
B. Fatty Acids and Energy
C. Digestion and Absorption of Carbohydrates
D. The Fates of Pyrovate

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SUGGESTED COURSE EVALUATION PROCEDURE:
Student Evaluations

[ End of Course Outline for 'CHEM2600' ]