

**GEORGIA PERIMETER COLLEGE**  
**DIVISION OF SCIENCE**  
**COMMON COURSE OUTLINE**  
**APPROVED: November 12, 2004**

<b>COURSE ABBREVIATION</b>	CHEM 2641L
<b>CREDIT HOURS</b>	1
<b>COURSE TITLE</b>	Fundamental Organic Chemistry I Laboratory
<b>PREREQUISITES</b>	CHEM 1212 lecture and lab with C or better
<b>COREQUISITE</b>	CHEM 2641 Lecture

**CATALOG DESCRIPTION**

A first semester organic laboratory to accompany CHEM 2641. Methods for the preparation, isolation, purification, and characterization of organic compounds. A minimum of three hours per week is scheduled.

**GENERAL COURSE PURPOSE**

This laboratory course is an introduction to the techniques and instrumentation used in the isolation and characterization of organic compounds. Students are introduced to the synthesis of simple organic molecules.

**GENERAL EDUCATION OUTCOMES**

- I. This course addresses the general education outcome relating to communications as follows:
1. The student must become proficient in the interpretation of technical procedures, such as those found in laboratory manuals, class handouts, and special instruction sheets.
  2. The student will develop the listening skills necessary to implement pre-laboratory lecture information efficiently.
  3. The student learns to transform ideas into written form in accurate detail.
  4. The student will learn to plan laboratory work by methods such as, the preparation of procedural outlines, researching literature, and reviewing theory from lecture sources.
- II. This course improves problem solving skills and critical thinking skills in the following ways.
1. By encouraging the student to use the team approach to develop problem solving strategies. The student is also encouraged to make informed choices in instances where more than one approach is possible to solving a problem.
  2. By instituting written evaluations where appropriate which employ a combination of objective and subjective criteria for judging a student's work.
  3. By encouraging instructors to conduct either formal or informal oral evaluations of student as a means of gauging the student's ability to communicate his or her depth of knowledge.

- III. This course addresses the general educational outcome relating to the recognition and application of the scientific method in a variety of settings as follows.
1. The student is challenged to identify causes of experimental error in a laboratory experiment and to identify the causal relationship between these experimental errors and their conclusions.
  2. The laboratory experiments chosen give the student an opportunity to investigate and apply theoretical concepts discussed in lecture. Conversely, in lecture the student is challenged to relate laboratory experiences with new theoretical concepts.
  3. Periodic quizzes and a comprehensive final exam are administered to monitor a student's progress in mastering the application of theory and practices emphasized in the course.

### **ENTRY LEVEL COMPETENCIES**

Upon entering this course, the student is expected to have mastery of concepts and problem solving skills covered through CHEM 1212&L, Principles of Chemistry II (and laboratory). These concepts and skills include, but are not limited to:

1. Ability to perform common analytical calculations such as, formula weight, moles, concentration, density, limiting reactants, and percent yields.
2. Ability to carry out quantitative laboratory experiments, to properly record observations and data in an orderly manner in a laboratory notebook, and to interpret the experimental results in a formal report when required.
3. Ability to organize experimental data into graphs that illustrate quantitative relationships.
4. Ability to make inferences between past experience and new problems.
5. Ability to find data and information in standard reference books for the purpose of making critical comparisons with other information from lecture or laboratory exercises.
6. Demonstrate with appropriate safety precautions, the correct use and handling of laboratory equipment and chemicals.

### **EXPECTED EDUCATIONAL RESULTS:**

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

1. Acquire physical constants relating to intrinsic properties such as melting point, boiling point, density, and refractive index.
2. To carry out an efficient fractional distillation on a simple liquid mixture.
3. To purify a liquid or solid compound by a variety of methods, including recrystallization from a solvent, distillation, or chromatography.
4. To separate a mixture of any combination of acid, base, or neutral organic compounds by a systematic series of solvent extractions and manipulations of pH.
5. To characterize compounds and evaluate the composition of organic mixtures by chromatographic methods such as thin layer chromatography, column chromatography, gas chromatography.
6. To demonstrate the appropriate safety practices for the correct usage of the equipment commonly found in the organic lab.

## **COURSE TOPICS**

1. Determination of intrinsic physical properties such as, melting point, boiling point, refractive index.
2. Computational determination of molecular properties such as, but not limited to:
  - minimized energy conformations by MM2 molecular mechanics
  - semi-empirical and ab initio methods
  - simulated spectroscopic parameters, eg. H1-NMR and C13-NMR.
  - other simulated computations as appropriate for the course
3. Instrumental methods of chemical analysis of compounds or mixtures, by spectroscopic methods (eg. IR, NMR, UV), or analytical chromatographic analysis (eg. GC or HPLC).
4. Purification techniques for simple liquids, simple solids, or a mixture of a combination of these. The techniques presented should include most or all of the following techniques.
  - simple distillation of a simple liquid
  - fractional distillation of liquid mixtures
  - crystallization of a simple solid
  - fractional crystallization of solid mixtures or mixtures of liquid and solid compounds
  - solvent extraction of mixtures containing any combination of an organic acid, organic base, and a neutral organic compound
  - column chromatography of a mixture of liquids, solids, or a combination of both
5. Introduction to organic synthesis. Selected experiments should be representative of the functional group transformations commonly covered in a first semester course of organic lecture at most other schools. Examples of experiments by topic would include, but are not limited to:
  - Synthesis, reactions, and analysis of alkanes
  - synthesis and reactions of alkenes; such as,
    1. preparation from alcohols or alkyl halides
    2. hydrogenation
    3. conversion to alcohols, alkyl halides, halohydrins, epoxides, etc.
  - synthesis and reactions of alcohols

## **ASSESSMENT OF EXPECTED EDUCATIONAL OUTCOMES**

The course grade will be determined by the individual instructor. A quantitative evaluation of the student will be made using a balanced combination of quizzes, outside homework, individual projects such as experiments, and written exercises such as notebooks and reports. The instructor shall assess the quality of these activities in a manner consistent with the norms common to the organic teaching profession, the general education outcomes and expected educational results. A comprehensive final exam is required that must count for no less than 20% and no more than 30% of the course grade.

November 12, 2004