Course Title: CHM 212 Organic and Biochemistry

Prerequisites: MAT011 or a passing score on the New Jersey Basic Skills Exam, CHM 100, CHM 112 or CHM 140

Course Description: CHM 212 is designed to give students an understanding of organic and biochemistry. The study of Organic Chemistry will emphasize a function-group approach to organic reactions. Topics in biochemistry will include carbohydrates, proteins, lipids, nucleic acids, bioenergetics, enzymes, and biosynthetic pathways.


STUDENT LEARNING OBJECTIVES: As a result of meeting the requirements in this course, students will be able to:

1. Students will learn to recognize organic compounds and complete organic reactions. Students will be assessed based on their performance on written examination and quizzes. Assessment will also be based on performance in the laboratory and the students’ analysis of experimental data.

2. Students will be able to identify each of the major classes of biochemical compounds. Students will be evaluated based on performance on written examinations and quizzes.

3. Students will learn how to recognize organic reactions as part of metabolic pathways. Students will be evaluated based on performance on written examinations and quizzes.

4. Students will be able to discuss new developments in the study of recombinant DNA. Students will be evaluated based on performance on written examinations and quizzes. Assessment will also be based on performance in the laboratory and the students’ analysis of experimental data.

5. Students will be able to explain the application of chemical principles to medical applications. Students will be evaluated based on performance on written examinations and quizzes.
Course Content:

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Topic</th>
<th>Student Learning Objectives</th>
</tr>
</thead>
</table>
| 1       | Organic Chemistry  
Sources of organic compounds, Structural Formulas, Functional Groups | 2, 3 |
| 2       | Alkanes  
Constitutional Isomer, Nomenclature,  
Cycloalkanes, Cis-Trans Isomers, Physical and Chemical Properties | 1, 2, 3, 5 |
| 3       | Alkenes and Alkynes  
Structure, Nomenclature, Physical and Chemical Properties, Polymerization | 1. 2, 3 |
| 4       | Benzene and Its Derivatives  
Structure, Nomenclature, Chemical Properties | 1, 2, 3, 5 |
| 5       | Alcohols, Ethers and Thiols  
Structure, Nomenclature, Physical and Chemical Properties | 1, 2, 3, 5 |
| 9       | Aldehydes and Ketones  
Structure, Nomenclature, Chemical Properties  
Keto-enol Tautomerism | 1, 2, 3, 5 |
| 8       | Amines  
Structure, Nomenclature (Omit IUPAC nomenclature),  
Physical and Chemical Properties | 1, 2, 3, 5 |
| 7       | Omit, Sec. 7.9  
Acids & Bases  
Acid Strength, Conjugate Acid-Base Pairs, Properties,  
pH, Buffers | 1. 5 |
| 10      | Carboxylic Acids  
Structure, Nomenclature, Physical and Chemical Properties, Soaps | 1, 2, 3, 5 |
| 11      | Carboxylic Anhydrides, Esters, and Amides  
Structure, Preparation, Chemical Properties,  
Phosphoric Esters and Anhydrides, Polymerization | 1, 2, 3, 5 |
| 6       | Chirality: The Handedness of Molecules  
Enantiomers, R, S System, Optical Activity | 1, 2, 3, 5 |
| 12      | Carbohydrates  
Monosaccharides, Cyclic Structure, Reactions,  
Disaccharides, Oligosaccharides and Polysaccharides | 1, 2, 3, 5 |
| 14      | Proteins  
Protein Functions, Amino Acids, Formation,  
Structural Organization, Denaturation | 1, 2, 3, 5 |
15 *Omit Sec. 15.2*
15.8 Enzymes
Terminology, Factors Influencing Activity, Mechanisms, Regulation, Medical Uses 1, 2, 3, 5

17 Nucleotides, Nucleic Acids and Heredity
Nucleic Acid Structure, Classes of RNA, Genes, DNA Replication, DNA Repair, DNA Amplification 1, 2, 3, 4, 5

18 *Omit Sec. 18.6* Gene Expression and Protein Synthesis
Transcription, Translation, Mutations, Recombinant DNA, Gene Therapy 1, 2, 3, 4, 5

13 *Sec. 13.10 & 13.11*
13.10 & 13.11 Optional
Lipids
Structure and properties of Triglycerides and Complex Lipids, Membranes 1, 2, 3, 5

19 *Omit Sec. 19.8*
Bioenergetics, How the Body Converts Food to Energy
Krebs Cycle, Electron Transport, Chemiosmotic Pump and ATP 1, 2, 3, 5

20 Specific Catabolic Pathways. Carbohydrate, Lipid, and Protein Metabolism – Sec. 20.1-20.3 only
Glycolysis 1, 2, 3, 5

21 Biosynthetic Pathways - Sec. 21.1-21.2 optional
Biosynthesis of Carbohydrates 1, 2, 3, 5

**NOTES:** The laboratory work is an integral part of the course. Students must complete the laboratory work in order to receive a passing grade in the course.

**EVALUATION:**
A. Examination (and quizzes)............. 75%
B. Laboratory work......................... 25%
TOTAL ................................100%

**ADDITIONAL NOTES:**
1. Students will be required to demonstrate the ability to explain concepts studied in this course. Examinations will include essay questions. Instructors may require additional writing assignments.

2. The scheduled examinations must be completed in order for the student to receive a grade in the course. A student will be allowed either to take one make-up exam or to use his/her final examination grade in place of one missed examination. At the discretion of the instructor this policy may be modified.

3. The course material is cumulative. Students experiencing difficulty with any segment of the course should see the instructor promptly as well as acquaint themselves with the tutorial services at the Tutoring Center.
INSTRUCTIONAL RESOURCES:


FACULTY ABSENCE PROCEDURE: A daily listing of cancelled classes will appear in designated glass cases. Students can consult these cases before going to class. If students find a class cancelled which has not been listed, they should report this to the Evening Office L-113 or the Divisional Dean's Office, A-325.

CHM212SCO.sp12
### CHM 212 LAB SCHEDULE


<table>
<thead>
<tr>
<th>Week</th>
<th>Experiment</th>
<th>Student Learning Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 &amp; 2</td>
<td>Check in, Experiment 21 - Structure of organic compounds: use of molecular models I and modeling with Spartan</td>
<td>1, 2, 3</td>
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<tr>
<td>3</td>
<td>Experiment 24 – Classification and Identification of Hydrocarbons</td>
<td>1, 2, 3</td>
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<tr>
<td>4 &amp; 5</td>
<td>Experiment 31 - Isolation of caffeine from tea leaves</td>
<td>1, 2</td>
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<tr>
<td>6 &amp; 7</td>
<td>Functional Group Analysis – Experiments 25 &amp; 26 and Computer Simulation (Handout)</td>
<td>1, 2, 3</td>
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<tr>
<td>8</td>
<td>Experiment 27 – Properties of Carboxylic Acids and Esters or Experiment 30 - Synthesis of Acetylsalicyclic Acid (Aspirin)</td>
<td>1, 2, 3, 5</td>
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<tr>
<td>9</td>
<td>Experiment 22 - Stereochemistry: Use of Molecular Models II</td>
<td>1, 2, 3, 5</td>
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<tr>
<td>10</td>
<td>Experiment 32 – Carbohydrates</td>
<td>1, 2, 3, 5</td>
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<tr>
<td>11</td>
<td>Experiment 40 - Isolation and Identification of Casein (omit Part A)</td>
<td>1, 2, 3</td>
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<td></td>
<td>or Experiment 41 – Properties of Enzymes</td>
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<tr>
<td>12 &amp; 13</td>
<td>Experiment 43 - Isolation and Identification of DNA from Onion or Experiment 34 – Preparation and Properties of a Soap</td>
<td>1, 2, 4, 5</td>
</tr>
<tr>
<td>14 &amp; 15</td>
<td>DNA Fingerprinting (Handout) Clean up, Check out</td>
<td>1, 2, 4</td>
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</tbody>
</table>

All BCC students enrolled in credit courses are entitled to a WebAdvisor account. With WebAdvisor, you may register online, check your schedule, room assignments, GPA, and find out what courses you need to take. Soon you will be able to use WebAdvisor to pay your tuition bills online. To find out more about WebAdvisor or to sign up online, visit [http://go.bergen.edu](http://go.bergen.edu)! While there, please make sure you give us your preferred email address. You'll find directions how to do this at [http://go.bergen.edu/email](http://go.bergen.edu/email).