

### Course Outline

**COURSE:** CHEM 30B      **DIVISION:** 10      **ALSO LISTED AS:**

**TERM EFFECTIVE:** Spring 2017      **CURRICULUM APPROVAL DATE:** 05/09/2016

**SHORT TITLE:** ELEM ORG/BIOCHEM

**LONG TITLE:** Elementary Organic and Biochemistry

<u>Units</u>	<u>Number of Weeks</u>	<u>Type</u>	<u>Contact Hours/Week</u>	<u>Total Contact Hours</u>
4	18	Lecture:	3	54
		Lab:	3	54
		Other:	0	0
		Total:	6	108

**COURSE DESCRIPTION:**

This is the second semester of a year-long elementary chemistry course designed as a continuation of Chemistry 30A. It is designed for science majors, nursing and allied health students. The course will cover the principles of organic and biochemistry including hydrocarbons, alcohols, aldehydes and ketones, carboxylic acids, amines and amides, carbohydrates, lipids, proteins and their functions in physiological systems, as well as organic chemical reactions. **PREREQUISITE:** Chemistry 30A with a grade of C or better.

**PREREQUISITES:**

Completion of CHEM 30A, as UG, with a grade of C or better.

**COREQUISITES:**

**CREDIT STATUS:** D - Credit - Degree Applicable

**GRADING MODES**

L - Standard Letter Grade

**REPEATABILITY:** N - Course may not be repeated

**SCHEDULE TYPES:**

- 02 - Lecture and/or discussion
- 03 - Lecture/Laboratory
- 04 - Laboratory/Studio/Activity

**STUDENT LEARNING OUTCOMES:**

1. Identify major classes of organic compounds including the various functional groups.
2. Demonstrate comprehension of alkanes and cycloalkanes including physical/chemical properties, isomers, structures and nomenclature.

Measure: Homework, Group activities, Quizzes, and Exams

PLO:

ILO: 2, 1, 7

GE-LO: B1, B3, B5, B6, A6

Year assessed or anticipated year of assessment: 2010

3. Demonstrate knowledge of alkenes, alkynes and benzene compounds including unsaturation, physical/chemical properties, isomers, structures and nomenclature.
4. Compare, contrast, and analyze the chemical reactions of alkenes, alkynes and benzene compounds.

Measure: Homework, Group activities, Quizzes, and Exams

PLO:

ILO: 2, 1, 7

GE-LO: B1, B3, B5, B6, A6

Year assessed or anticipated year of assessment: 2015

5. Demonstrate understanding of alcohols, phenols, ethers, and thiols including physical/chemical properties, structures, and nomenclature.
6. Compare, contrast, and analyze the chemical reactions of alcohols, phenols, ethers, and thiols.

Measure: Homework, Group activities, Quizzes, and Exams

PLO:

ILO: 2, 1, 7

GE-LO: B1, B3, B5, B6, A6

Year assessed or anticipated year of assessment: 2015

7. Demonstrate comprehension of aldehydes and ketones including physical/chemical properties, structures, and nomenclature.
8. Compare, contrast, and analyze the chemical reactions of aldehydes and ketones.

Measure: Homework, Group activities, Quizzes, and Exams

PLO:

ILO: 2, 1, 7

GE-LO: B1, B3, B5, B6, A6

Year assessed or anticipated year of assessment: 2015

9. Demonstrate knowledge of carboxylic acids and esters including physical/chemical properties, structures, and nomenclature.
10. Compare, contrast, and analyze the chemical reactions of carboxylic acids and esters.

Measure: Homework, Group activities, Quizzes, and Exams

PLO:

ILO: 2, 1, 7

GE-LO: B1, B3, B5, B6, A6

Year assessed or anticipated year of assessment: 2016

11. Demonstrate understanding of amines and amides including physical/chemical properties, isomers, structures and nomenclature.
12. Compare, contrast, and analyze the chemical reactions of amines and amides.

Measure: Homework, Group activities, Quizzes, and Exams

PLO:

ILO: 2, 1, 7

GE-LO: B1, B3, B5, B6, A6

Year assessed or anticipated year of assessment: 2016

13. Demonstrate comprehension of stereochemistry including isomerism, chirality, optical activity, and analyze the assignment of configuration of organic molecules.

14. Demonstrate knowledge of carbohydrates and lipids including physical/chemical properties, isomers, structures, and nomenclature.

15. Compare, contrast, and analyze the chemical reactions of carbohydrates and lipids.

Measure: Homework, Group activities, Quizzes, and Exams

PLO:

ILO: 2, 1, 7

GE-LO: B1, B3, B5, B6, A6

Year assessed or anticipated year of assessment: 2010

16. Demonstrate understanding of amino acids and proteins including physical/chemical properties, structures and nomenclature.

17. Compare, contrast, and analyze the chemical reactions of amino acids and proteins.

Measure: Homework, Group activities, Quizzes, and Exams

PLO:

ILO: 2, 1, 7

GE-LO: B1, B3, B5, B6, A6

Year assessed or anticipated year of assessment: 2010

18. Demonstrate comprehension of nucleic acids, DNA and RNA including physical/chemical properties, structures, and nomenclature.

19. Compare, contrast, and analyze the chemical reactions of nucleic acids, DNA, and RNA.

Measure: Homework, Group activities, Quizzes, and Exams

PLO:

ILO: 2, 1, 7

GE-LO: B1, B3, B5, B6, A6

Year assessed or anticipated year of assessment: 2016

20. Collect and analyze laboratory experimental data and solve related chemical problems.

21. Examine chemical concepts through peer interaction and written laboratory reports.

22. Relate classroom and laboratory experiences to phenomena outside the classroom.

Measure: Homework, Group activities, Quizzes, and Exams

PLO:

ILO: 2, 1, 4, 6

GE-LO: B4, B7, B8, A5

Year assessed or anticipated year of assessment: 2016

PROGRAM LEARNING OUTCOMES:

Employing the scientific method as a basis for evaluation theoretical and laboratory derived information, students will gain an understanding of the biological and/or physical worlds. Students will also gain a working familiarity with mathematics and an understanding of mathematics as it applies to modeling in the sciences.

## **CONTENT, STUDENT PERFORMANCE OBJECTIVES, OUT-OF-CLASS ASSIGNMENTS**

Curriculum Approval Date: 05/09/2016

Week/Topic 1-2

12 Hours

Chapter-11 Organic Chemistry. Saturated Hydrocarbons

Structural features of organic compounds. Isomerism. Functional groups. Alkanes and cycloalkanes. Nomenclature of alkanes and

cycloalkanes. The physical and chemical properties of alkanes and cycloalkanes.

Homework problems from text and instructor.

Laboratory Experiment: Locker Check-In and Safety.

Laboratory Experiment: Isomerism.

Identify major classes of organic compounds including functional groups.

Demonstrate comprehension of alkanes and cycloalkanes including physical/chemical properties, isomers, structures, and nomenclature.

Week/Topic 3-4

12 Hours

Chapter-12 Unsaturated Hydrocarbons

Their occurrence in nature. Nomenclature of alkenes and alkynes.

Geometric isomers. Addition reactions of the double and triple bonds.

How addition reactions occur. Addition polymers. The benzene ring and aromatic properties. Nomenclature of benzene compounds.

Homework problems from text and instructor.

Laboratory Experiment: Hydrocarbons.

Laboratory Experiment: Structure and Solubility.

Demonstrate comprehension of alkenes, alkynes, and benzene compounds including unsaturation, physical/chemical properties, isomers, structures, and nomenclature.

Compare, contrast, and analyze the chemical reactions of alkenes, alkynes, and benzene compounds.

Week/Topic 5-6

12 Hours

Chapter-13 Alcohols, Phenols, Ethers, and Thioalcohols

The occurrence, types, and nomenclature of alcohols. Physical properties of alcohols. Chemical properties of alcohols. Phenols.

The occurrence, nomenclature, and physical properties of ethers, thioalcohols, and disulfides. Chemical properties and reactions of ethers, thio-alcohols, and disulfides.

Homework problems from text and instructor.

Laboratory Experiment: Oxidation of Alcohols.

Demonstrate comprehension of alcohols, phenols, ethers, and thioalcohols including physical/chemical properties, structures, and nomenclature.

Compare, contrast, and analyze the chemical reactions of alcohols, phenols, ethers, and thioalcohols.

Week/Topic 7-8

12 Hours

Chapter-14 Aldehydes and Ketones

Structures and physical properties of aldehydes and ketones.

Nomenclature of aldehydes and ketones. Oxidation of aldehydes and ketones. Reduction of aldehydes and ketones. Chemical properties and reactions of aldehydes and ketones.

Homework problems from text and instructor.

Laboratory Experiment: Oxidation of Carbonyl Compounds.

Demonstrate comprehension of aldehydes and ketones including physical/chemical properties, structures, and nomenclature. Compare, contrast, and analyze the chemical reactions of aldehydes and ketones.

Week/Topic 9-10

12 Hours

Chapter-15 Carboxylic Acids and Esters

The occurrence, nomenclature, and physical properties of carboxylic acids. Acidity of carboxylic acids. Conversion of carboxylic acids to esters. The occurrence, nomenclature, and physical properties of esters. Chemical properties and reactions of esters.

Organophosphate esters and anhydrides.

Homework problems from text and instructor.

Laboratory Experiment: Esterification.

Laboratory Experiment: Synthesis of Aspirin.

Demonstrate comprehension of carboxylic acids and esters including physical/chemical properties, structures, and nomenclature.

Compare, contrast, and analyze the chemical reactions of carboxylic acids and esters.

Week/Topic 11

6 Hours

Chapter-16 Amines and Amides

The occurrence, nomenclature, and physical properties of amines.

Chemical properties and reactions of amines. The occurrence, nomenclature, and physical properties of amides. Chemical properties and reactions of amides.

Homework problems from text and instructor.

Laboratory Experiment: Basicity of Amines.

Demonstrate comprehension of amines and amides including physical/chemical properties, structures, and nomenclature.

Compare, contrast, and analyze the chemical reactions of amines and amides.

Week/Topic 12

6 Hours

Chapter-17 Stereoisomerism

Types of isomerism. Molecular chirality of organic molecules.

Optical activity.

Homework problems from text and instructor.

Laboratory Experiment: Optical Activity.

Demonstrate comprehension of stereochemistry including isomerism, chirality, optical activity, and specific rotation.

Compare, contrast, and analyze the assignment of configuration of organic molecules.

Week/Topic 13-14

12 Hours

Chapter-18 Carbohydrates

An overview of biochemistry. Introduction to monosaccharides.

The D- and L- families of carbohydrates. Cyclic forms of

monosaccharides. Disaccharides. Polysaccharides.

Homework problems from text and instructor.

Laboratory Experiment: Test for Carbohydrates.

Laboratory Experiment: Determination of Ascorbic Acid.

Demonstrate comprehension of carbohydrates including physical/chemical properties, isomers, structures, and nomenclature.

Compare, contrast, and analyze the chemical reactions of carbohydrates.

Week/Topic 15

6 Hours

Chapter-19 Lipids

The occurrence, nomenclature, and physical properties of lipids.

Chemical properties and reactions of triacylglycerols. Phospholipids.

Steroids. The lipid components of cell membranes.

Homework problems from text and instructor.

Laboratory Experiment: Test for Lipids.

Demonstrate comprehension of lipids including physical/-chemical properties, structures, and nomenclature.

Compare, contrast, and analyze the chemical reactions of lipids.

Week/Topic 16

6 Hours

Chapter-20 Proteins

Amino acids-The building blocks of proteins. Overview of protein structure. Primary structures of proteins. Secondary structures of proteins. Tertiary structures of proteins. Quaternary structures of proteins. Common properties of proteins. Glycoprotein components of cell membranes. Classes of proteins.

Homework problems from text and instructor.

Laboratory Experiment: DNA Fingerprinting.

Demonstrate comprehension of amino acids and proteins including physical/chemical properties, structures, and nomenclature.

Compare, contrast, and analyze the chemical reactions of amino acids and proteins.

Week/Topic 17

6 Hours

Chapter-24 Nucleic Acids

Heredity and the cell. Structure of nucleic acids. Ribo-nucleic acids. mRNA-Directed polypeptide synthesis. Recombinant DNA technology and genetic engineering.

Homework problems from the text and instructor.

Laboratory Experiment: DNA Fingerprinting.

Demonstrate comprehension of nucleic acids, DNA, and RNA including physical/chemical properties, structures, and nomenclature.

Compare, contrast, and analyze the chemical reactions of nucleic acids, DNA, and RNA.

Week/Topic 18

2 Hours

Final Examination (cumulative).

Comprehensive over the entire course with evaluation of each of the areas previously encountered.

**ASSIGNMENTS:**

Included in content section.

**METHODS OF INSTRUCTION:**

Instruction is by lecture, class discussion, lecture, demonstration, small group problem solving, laboratory work projects, homework and exams.

**METHODS OF EVALUATION:**

CATEGORY 1 - The types of writing assignments required:

Percent range of total grade: 20 % to 30 %

Written Homework

Lab Reports

Other: Extra Credit report on an organic chemistry topic.

CATEGORY 2 -The problem-solving assignments required:

Percent range of total grade: 70 % to 80 %

Homework Problems

Lab Reports

Quizzes

Exams

CATEGORY 3 -The types of skill demonstrations required:

Percent range of total grade: 0 % to %

CATEGORY 4 - The types of objective examinations used in the course:

**REPRESENTATIVE TEXTBOOKS:**

Required:

- |   |   |   |          |
|---|---|---|----------|
| 1.) J. McMurry,<br>D.S. Ballantine,<br>C.A. Hoeger,<br>V.E Peterson | 1.) "Fundamentals of General,<br>Organic, and Biological<br>Chemistry." 8th ed. | 1.) Pearson/Prentice<br>Hall Publishing | 1.) 2016 |
| 2.) D. Clark, G. Burce,<br>E. Kilby                                 | 2.) "Gavilan College Chem 30B<br>Laboratory Manual," 2nd ed.                    | 2.) Premium Source<br>Publishing        | 2.) 2015 |

Or other appropriate college level text.

Recommended:

- |   |   |   |          |
|---|---|---|----------|
| 1.) J. McMurry,<br>D.S. Ballantine,<br>C.A. Hoeger,<br>V.E Peterson | 1.) "Study Guide & Solution<br>Manual," 8th ed. | 1.) Pearson/Prentice<br>Hall Publishing | 1.) 2016 |
|---|---|---|----------|

ISBN: 978-0-321-75083-9

978-1-634-34143-1

978-0-321-77616-7

Reading level of text, Grade: 12      Verified by: D. Clark

Other textbooks or materials to be purchased by the student: None

**ARTICULATION and CERTIFICATE INFORMATION**

Associate Degree:

GAV B1, effective 201370

GAV B3, effective 201370

CSU GE:

CSU B1, effective 201370

CSU B3, effective 201370

IGETC:

IGETC 5A, effective 201370

IGETC 5C, effective 201370

CSU TRANSFER:

Transferable CSU, effective 201370

UC TRANSFER:

Transferable UC, effective 201370

**SUPPLEMENTAL DATA:**

Basic Skills: N

Classification: Y

Noncredit Category: Y

Cooperative Education:

Program Status: 1 Program Applicable

Special Class Status: N

CAN: CHEM8

CAN Sequence: CHEM SEQ B

CSU Crosswalk Course Department: CHEM

CSU Crosswalk Course Number: 30B

Prior to College Level: Y

Non Credit Enhanced Funding: N

Funding Agency Code: Y

In-Service: N

Occupational Course: E

Maximum Hours:

Minimum Hours:

Course Control Number: CCC000280630

Sports/Physical Education Course: N

Taxonomy of Program: 190500