

BUTTE COLLEGE

COURSE OUTLINE

I. CATALOG DESCRIPTION

CHEM 52 - Elementary Organic and Biochemistry

4 Unit(s)

Prerequisite(s): CHEM 51

Recommended Prep: NONE

Transfer Status: CSU/UC

51 hours Lecture

51 hours Lab

This course provides an introduction to the chemistry of carbon compounds including organic nomenclature and functional group chemistry. Biochemistry topics include optical isomerism, carbohydrates, lipids, proteins and nucleic acids as they apply to living systems. Recommended for allied health and applied science majors. (C-ID CHEM 102). Graded only.

II. OBJECTIVES

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

- Demonstrate an understanding of the basic principles of modern organic and biological chemistry.
- Use appropriate chemical vocabulary.
- Apply appropriate problem solving and analytical reasoning abilities to solve organic and biological chemistry problems.
- Demonstrate laboratory skills appropriate to organic and biological chemistry.

III. COURSE CONTENT

A. Unit Titles/Suggested Time Schedule

Lecture	
<u>Topics</u>	<u>Hours</u>
1. Review of general chemistry concepts	2.00
2. Hydrocarbons: Alkanes and Cycloalkanes	5.00
3. Hydrocarbons: Alkenes, Alkynes and Aromatic Compounds	4.00
4. Alcohols, Ethers, Thiols and Amines	7.00
5. Aldehydes and Ketones	5.00
6. Carboxylic Acids and their Derivatives	5.00
7. Stereochemistry	3.00
8. Lipids	3.00
9. Amino Acids and Proteins	5.00
10. Carbohydrates	5.00
11. Nucleic Acids	3.00
12. Overview of Metabolic Cycles	4.00
Total Hours	51.00

Lab

<u>Topics</u>	<u>Hours</u>
1. Exercises on Structure (drawing and naming organic compounds), Isomerism (stereoisomerism) and Spectroscopy (IR spectroscopy)	12.00

2. Recrystallization (purification and recrystallization of acetanilide)	3.00
3. Distillation (distillation of fermented grape juice)	6.00
4. Natural Product Isolation (extraction of caffeine from tea leaves; extraction of protein, carbohydrate and fat from milk; extraction of triglycerides from chips)	12.00
5. Synthesis and Analysis of Compounds (synthesis of wintergreen oil; synthesis of hand cream; analysis of aspartame; hydrolysis of sucrose; synthesis of soap)	15.00
6. Solubility of organic compounds	3.00
Total Hours	51.00

IV. **METHODS OF INSTRUCTION**

- A. Lecture
- B. Demonstrations
- C. Laboratory Experiments
- D. Laboratory Exercises
- E. Homework: Students are required to complete two hours of outside-of-class homework for each unit of credit.

V. **METHODS OF EVALUATION**

- A. Quizzes
- B. Final Examination
- C. Written Examinations
- D. Laboratory Reports and Exercises

VI. **EXAMPLES OF ASSIGNMENTS**

- A. Reading Assignments
 - 1. Read the section on hemiacetals and acetals. Be prepared to explain the difference between a hemiacetal and an acetal.
 - 2. Read the section on amides. Be prepared to explain the reason that an unsubstituted amide has a higher boiling point than a comparable disubstituted amide.
- B. Writing Assignments
 - 1. Write a paragraph explaining the structural differences between 1°, 2° and 3° alcohols and how these differences affect their abilities to be oxidized.
 - 2. Write a paragraph explaining the reasons that amines are bases.
- C. Out-of-Class Assignments
 - 1. After researching the thiol functional group, explain what products form when thiols are oxidized.
 - 2. After researching the acid-base properties of amino acids, explain why acidic amino acids have a net negative charge at physiological pH, and basic amino acids have a net positive charge at physiological pH.

VII. **RECOMMENDED MATERIALS OF INSTRUCTION**

Textbooks:

- A. McMurry, J., Ballantine, D., Hoeger, C., Peterson, V. Fundamentals of General, Organic and Biological Chemistry. 7th Edition. Prentice-Hall, Upper Saddle River NJ, 2013.
- B. Wannenmacher, E. Laboratory Manual for Chemistry 52. 2014 Edition. Butte College, 2014.

Materials Other Than Textbooks:

- A. Molecular model kit

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