



CHEM 104 - CHEMISTRY OF LIVING THINGS (INTRODUCTION TO GENERAL, ORGANIC, AND BIOCHEMISTRY)

Units Lecture	3.00	Units Lab	2.00	Units Total	5.00
Total Hrs Lecture	49.50	Total Hrs Lab	99.00	Total Course Hrs	148.50

COURSE DESCRIPTION

The Chemistry of Living Things--Introduction to General, Organic and Biochemistry surveys the concepts and skills of the chemistry of living organisms, with emphasis on the human body. Topics include the structure of the atom, chemical bonding, chemical reactions, the structure and reactions of organic compounds, carbohydrates, lipids, amino acids and proteins, nucleic acids, and metabolism, with applications in the physiology, nutrition and pharmacology of the human body. This course includes both lecture and laboratory components, and meets the needs of many students planning to transfer in nursing and other health-related fields (check with program advisor or transfer institution for specific information on transferability). Students cannot take CHEM 104 if CHEM 102 has been completed. UC credit limitation: Credit for CHEM 102 or 104. No credit if taken after CHEM 102.

ENROLLMENT RESTRICTIONS

PREREQUISITES

None

COREQUISITES

None

ADVISORIES

High School level math skills.

OUTLINE OF COURSE CONTENT

The course will address the following topics:

LECTURE

Scientific method and reasoning, measurements (SI units, significant figures), unit conversions. (3 hours)
 Structure and classification of matter, atomic structure, electronic configurations, radioactivity, the periodic table. (3 hours)
 Chemical bonding. (2 hours)
 Chemical reactions--classification, writing and balancing equations. (2 hours)
 Chemical calculations/stoichiometry. (2 hours)
 States of matter (gases, liquids, solids) and intermolecular forces. (2 hours)
 Solutions, acids, bases and salts. (3 hours)
 Structure, properties and reactions of organic compounds--saturated, unsaturated and aromatic hydrocarbons, alcohols, ethers, amines, halides, aldehydes and ketones, and carboxylic acids and their derivatives. (10 hours)
 Structure, properties, biosynthesis, reactivity and function of biological compounds: carbohydrates, lipids, proteins and enzymes, and nucleic acids. (12 hours)
 Metabolism. (3 hours)
 Other topics in the biochemistry, physiology, genetics, nutrition and pharmacology of the human body. (6 hours)
 TOTAL FOR LECTURE TOPICS: 48 hours.

LABORATORY

Exercises and experiments illustrating and applying concepts, and developing laboratory skills:
 General Chemistry--30 hours.
 Organic Chemistry--30 hours.
 Biochemistry--30 hours.
 Other related topics--6 hours.
 TOTAL FOR LABORATORY TOPICS: 96 hours.

PERFORMANCE OBJECTIVES

Upon successful completion of this course, students will be able to do the following:

- Construct cause-and-effect explanations for chemical phenomena, especially those that are most important in the functioning of living things, including the systems of the human body.
 - Analyze and interpret the Periodic Table of the Elements to predict and/or explain a given element's fundamental physical and chemical properties.
 - Organize and synthesize information about a substance's composition and structure to construct a model that predicts and explains that substance's fundamental chemical and physical properties.
 - Describe and explain the structures and functions of the major classes of biological compounds.



- D. Describe and explain the major biosynthetic and metabolic pathways found in living things.
E. Synthesize the principles and concepts listed above to describe and explain basic aspects of the biochemistry, physiology, genetics, nutrition and pharmacology of the human body.
2. Recognize, analyze, set up and solve problems involving the application of chemical principles and the scientific method.
A. Represent chemical reactions using balanced reaction equations, categorize chemical and biochemical reactions based on reactants, and predict the products of these reactions based on their categories.
B. Examine historical and modern accounts of experimental and theoretical advances in general, organic and biological chemistry, and analyze the application of the scientific method in these cases.
3. Apply the scientific method and chemical principles in the chemical laboratory.
A. Demonstrate and evaluate a variety of basic general, organic and biological chemistry laboratory skills and procedures.
B. Design, perform, interpret and evaluate experiments in order to answer questions related to the chemistry of living things, including measurement of physical and chemical properties, and investigation of the chemical systems of the human body.
4. Communicate clearly and effectively, in both written and oral modes, the process and results of problem-solving, laboratory work, library and internet research, group work, etc.
5. Work individually and with other students to effectively accomplish goals, solve problems and communicate with the rest of the class (and the rest of the world, as appropriate).

READING ASSIGNMENTS

Reading assignments will be consistent with, but not limited by, the following types and examples:

WRITING ASSIGNMENTS

Writing assignments will be consistent with, but not limited by, the following types and examples:

OUTSIDE-OF-CLASS ASSIGNMENTS (READING/WRITING/OTHER)

Outside-of-class assignments will be consistent with, but not limited by, the following types and examples:

Reading Assignments:

Lecture:

Textbook and handouts

Laboratory:

Laboratory textbook, exercise and experiment handouts

Writing, Problem Solving or Performance:

Lecture:

Homework sets (writing and problem-solving)

Laboratory:

Laboratory notebook and reports (writing, performance and problem-solving)

Other:

Project(s): research papers, library literature projects, group projects and/or oral presentations (number, nature and type of projects to be determined by instructor)

STUDENT LEARNING OUTCOMES

Learning Outcome

1. Students will identify an acid-base buffer system based on the components of the system, and explain why a buffer resists a change in pH, based on the concepts of conjugate acids and bases.

Mode of Assessment

1. Written essay question on exam. Students will be given a description of an acid/base system, and instructed to determine whether the system will act as a buffer. Students will also be instructed to predict and explain the effects of adding a small amount



2. Students will analyze and interpret the periodic table to predict and explain an element's physical and chemical properties, based on the concepts of atomic structure, electron configurations and periodic properties.
3. Students will analyze a given chemical reaction, including the amounts of reactants, to write its balanced equation and to calculate the theoretical yield of the products, based on the concepts of molar mass and stoichiometry.
2. Written essay question on exam, including cause and effect reasoning. Students will be given a periodic table, and instructed to compare particular property or properties of two or more elements
3. Written problem where students must write and balance the chemical reaction equation in symbol form, based on a written description of the reaction. Students will also construct and perform a calculation to determine the theoretical yield of a product.

METHODS OF INSTRUCTION

Instructional methodologies will be consistent with, but not limited by, the following types or examples:

METHODS OF EVALUATION

Evaluation methodologies will be consistent with, but not limited by, the following types or examples:

Substantial writing assignments which reflect critical and creative thinking:

Essay exams

Lab reports

Term or other papers

Written homework

Other - Lab notebooks; other projects.

Computational or non-computational problem-solving or skill demonstrations:

Exams

Homework problems

Lab reports

Quizzes

Objective examinations:

Completion

Matching items

Multiple choice

True/false

Other - Objective exams will consist of any or all of these types of questions/problems, plus short answer and explanation questions/problems.

REQUIRED TEXTBOOKS

Examples of typical textbooks for this course include the following:

Author: Stoker

Title: Essentials General, Organic, & Biochem

Publisher: Houghton Mifflin

Date of Publication: 2003

Edition: 1st

ISBN: 0-618-26709-3

Author: Timberlake

Title: Chemistry: Intro to GOB Chemistry

Publisher: Benjamin Cummings

Date of Publication: 2006

Edition: 9th

ISBN: 0-805-33015-1

Author: Timberlake

Title: Lab Manual for GOB Chemistry



Publisher: Benjamin Cummings
Date of Publication: 2002
Edition: 1st
ISBN: 0-805-32984-6

OTHER REQUIRED INSTRUCTIONAL MATERIALS

Bound laboratory notebook
Laboratory safety splash goggles
Laboratory gloves
Scientific calculator

COURSE REPEATABILITY

Total Completions Allowed:

1

In Combination With: