

COURSE OUTLINE

Course Department and Number <u>Chemistry 3B</u>	Program <u>Chemistry</u>
Course Title <u>Introductory Organic & Biological</u> <u>Chemistry (Formerly Chemistry 3)</u>	Date: <u>March 6, 1996</u>
Catalog Description: <input type="checkbox"/> existing <input type="checkbox"/> clarified <input checked="" type="checkbox"/> revised <input type="checkbox"/> new (check one)	
Prerequisite: <input checked="" type="checkbox"/> existing <input type="checkbox"/> clarified <input type="checkbox"/> revised <input type="checkbox"/> new (check one)	
Corequisite: <input checked="" type="checkbox"/> existing <input type="checkbox"/> clarified <input type="checkbox"/> revised <input type="checkbox"/> new (check one)	
Advisory: <input type="checkbox"/> existing <input type="checkbox"/> clarified <input type="checkbox"/> revised <input checked="" type="checkbox"/> new (check one)	
<u>3</u> unit(s) <u>2</u> lecture hour(s) <u>3</u> laboratory hour(s) <u>0</u> number of repeats (maximum = 3)	
<u> </u> credit/no credit only	
Prerequisite: <u>Chemistry 3A.</u>	
Corequisite: <u>None.</u>	
Advisory: <u>Eligibility for English A, 53, or 54D recommended.</u>	
Description: <u>Introduction to the basic concepts of organic and biochemistry. Structure and behavior of organic and biological compounds, metabolism, and regulation. Primarily for students in the health-oriented professions. Not a substitute for Chemistry 3A. (CHEM 3A+3B = CAN CHEM SEQ B)</u>	
Entry Level Skills:	
Upon entering the course, the student should be able to:	
<ol style="list-style-type: none"> 1. employ context clues and affix analysis to determine meanings of unfamiliar words; use dictionaries; determine main ideas and literal meaning; identifying important details; paraphrasing reading selections; use inference to determine implicit ideas; draw conclusions based on inferences; understand reading selections using literal and inferential comprehension skills; 2. read actively by previewing, questioning, paraphrasing, and tracing clues that lead to implied meaning embedded in reading selections; 3. comprehend academic reading materials associated with success in degree-applicable courses; 4. write short compositions which limit subjects, unify content by common purposes or main ideas, adequately develop ideas; specify and supply details, use appropriate diction, and avoid extensive errors in grammar, usage and mechanics; 5. demonstrate familiarity with names, spelling and symbols of chemical elements; 6. write Lewis structures and covalent bonding; 7. write and balance chemical equations; 8. use laboratory skills including use and manipulation of lab glassware and instruments and safety procedures and record and interpret lab data; and 9. demonstrate familiarity with acid-base concept, pH and buffers. 	
Requested Credit Classification (Applicant) <input checked="" type="checkbox"/> Degree Applicable <input type="checkbox"/> Noncredit <input type="checkbox"/> Non-Degree Applicable <input type="checkbox"/> Revised	<input type="checkbox"/> Course contains an international component.

Expected Outcomes/Objectives:

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

General

1. recognize the interrelationship between a study of organic chemistry and biochemistry;
2. demonstrate an appreciation for the impact of chemistry on modern society with particular emphasis on the growth of chemical information by the scientific process
3. define the interrelationships between chemistry, biology, and medicine and the arts;
4. prepare for further studies in life sciences with regard to organic substances and basic physiological chemistry and metabolism.
5. demonstrate skills in making observations, drawing conclusions, using laboratory controls, and in recognizing error probability;

Specific

1. define organic chemistry and relate the electronic structure of the carbon atom to the bonds it can form.
2. draw and identify simple straight-chain alkanes, cyclic alkanes, alkenes, and alkynes, their isomers, and alkyl groups, and to name branched alkanes by the IUPAC system;
3. distinguish between aromatic and aliphatic compounds;
4. describe the relationship between the structure and reactions of aromatic compounds;
5. identify halogen derivatives of hydrocarbons;
6. describe the meaning of functional groups in organic molecules, especially these: alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, thiols, nitrogen-containing compounds (amines, amides, heterocyclic amines, and alkaloids);
7. recognize and interpret organic chemical reactions that lead to the formation or the destruction of the organic molecules listed above;
8. explain the basicity of amines and the acidity of carboxylic acids;
9. identify and give examples of both addition and condensation polymers;
10. classify carbohydrates according to their size, number of carbon atoms, and the location of the carbonyl group;
11. explain the relationship between open and closed forms of monosaccharides;
12. describe the relationship between enantiomers, especially for the carbohydrates;
13. describe the structure and role of important polysaccharides such as starch, glycogen, and cellulose;
14. describe the major reactions of carbohydrates;
15. describe the structure of a fat, a fatty acid, a soap, a detergent, and of waxes;
16. recognize and identify the role of "depot" lipid in the body;
17. write equations for the hydrolysis and saponification of triacylglycerols;
18. identify phospholipids and sphingolipids from their structural formulas; describe the role of hormones and identify steroid hormones;
19. identify features common to the 20 major amino acids, and describe the properties of amino acids.
20. compare the main forms of protein secondary structure; explain the facts that maintain the tertiary structure of a protein; and explain denaturation and hydrolysis of proteins;
21. classify proteins according to their shape, solubility, and function;
22. identify hormones that are peptides and proteins;
23. explain what an enzyme does and how it works; classify enzymes according to their function and substrate, and recognize the role of vitamins in enzymology;
24. explain how enzyme activity is regulated;
25. describe role of enzymes in digestion of carbohydrates, of lipids, and of proteins, and describe how enzymes are used for medical diagnosis and therapy;
26. explain the relationship between catabolism, anabolism, and chemical energy, and describe how chemical energy is stored and transferred in metabolic reactions;
27. describe the major steps in: glycolysis, the citric acid cycle, the respiratory chain in catabolism; anabolic carbohydrate metabolism, glycogen metabolism (glycogenesis and glycogenolysis);
28. describe the relationship between carbohydrate metabolism and blood glucose level;
29. describe the catabolism of fatty acids; contrast lipogenesis to the fatty acid cycle, describe the role of acetyl CoA carbohydrate and lipid metabolism; and describe the causes and effects of ketosis;
30. describe the relationship of dietary lipids to body lipids, blood lipids, and health;
31. identify and describe the metabolism of proteins with regard to sources and used of nitrogen, the balance of nitrogen, and the urea cycle;

Texts, Other Readings, and Materials:

Text(s): Bettelheim & March, Intro Organic & Biochemistry, Current Edition, Saunders, Fort Worth, TX.
Lab Manual: Bettelheim & Landesberg, Lab Manual for General Organic & Biochemistry, Current Edition, Saunders, Fort Worth, TX.
Optional: Scovell, Study Guide to Accompany Intro Organic & Biochemistry, Current Edition, Saunders, Fort Worth, TX.
References: Weast, Handbook of Chemistry and Physics, Current Edition, CRC Press, Boca Raton, FL.

Materials: Calculator with scientific notation
Safety goggles as specified by lab instructor
Periodic chart by Sargent-Welch, Buffalo Grove, IL
Lab supplies: matches, sponge, dish soap, towel

Primarily College Level

Adoptions at major colleges and universities
and by professional judgment.

Primarily not College Level

(How Determined)

Assignments:

4 hours per week (for equivalent)

Permissible exceptions to the common interpretation as stated are as follows: (AR 7200 (1) (2) (3) (4) (circle one))

List types:

1. Daily reading assignments pertaining to scheduled lectures ~~materials~~
2. Periodic reading assignments (before lab classes) pertaining to scheduled lab ~~materials~~
3. Daily problem assignments pertaining to presented lecture or lab ~~materials~~

Class participation and assignments require and develop critical thinking (see Expected Outcomes/Objectives). Describe how:

In order to prepare successfully for class discussions, lectures, and evaluation, the student will be required to apply principles learned in readings and in previous class sessions. To solve elementary chemistry problems, students must extend familiar principles and adapt them to new circumstances. Often they will be required to synthesize new concepts by extrapolating or combining other ideas.

Primarily College Level

Not Primarily College Level

2 hours of independent work done out of class per each hour of lecture or class work, or 3 hours lab, practicum, or the equivalent, per unit. **Ratio of amount of work per unit of credit required by curriculum committee for a non-degree credit course is maintained.**

Assessment:

Grades will be based upon:

ESSAY*

Assignments and tests consist mainly of reading and solving problems which do not involve significant use of detailed written explanations.

COMPUTATION*

NON-COMPUTATIONAL PROBLEM-SOLVING*

Examples: Applying previously learned chemical principles to explain or predict trends encountered in new situations.

[X] SKILL DEMONSTRATION

Kind: Mathematical and reasoning skills, laboratory apparatus manipulation skills.

[X] MULTIPLE CHOICE

[X] OTHER: Describe

Completion-type questions, lab reports, tests, check of lab work tagged in from experiments.

***For degree credit: At least one of the first three boxes above must be checked, and if "essay" is not checked, it must be explained why essays are an inappropriate basis for at least 25% of the grade in the course.**

Expanded Description of Content and Methods:

Approx. Class Hours

Content:

Lecture Topics

- | | |
|---|---|
| 1. Introduction | 1 |
| 2. Hydrocarbons | 3 |
| 3. Alcohols, Phenols, Ethers, and Halides | 2 |
| 4. Aldehydes and Ketones | 2 |
| 5. Carboxylic Acids and Esters | 2 |
| 6. Amines and Amides | 2 |
| 7. Carbohydrates | 3 |
| 8. Lipids | 2 |
| 9. Proteins | 2 |
| 10. Enzymes | 2 |
| 11. Bioenergetics and Carbohydrate Metabolism | 3 |
| 12. Lipid and Protein Metabolism | 2 |
| 13. Nucleic Acids and Protein Synthesis | 2 |

Laboratory: Each lab period is approximately 3 hours

1. Orientation, safety, locker check-in
2. Review of Chemical Calculations
3. Rates of Chemical Reactions: The Iodine Clock Reaction
4. Acid-based Equilibrium: Acid-based Titration
5. The Structure of Organic Compounds: Molecular Models
6. Acetanilide Recrystallization
7. Purification of Organic Molecules: Caffeine Isolation
8. Organic Synthesis: The Preparation of Aspirin
9. Thin-layer Chromatography of Aspirin and Other Analgesic Drugs
10. Sights and Smells of Organic Chemistry
11. Common Reactions in Organic Chemistry
12. Preparation of Soaps and Detergents
13. Enzymes: Cheesemaking
14. Structure and Function of Nucleic Acids
15. Enzyme Activities and Regulation
16. Electrophoretic Separation of Isozymes of LDH

Methods:

- 1. Lecture periods are used to discuss principles and to provide specific examples designed to promote better understanding. Out of class assignments may be discussed if appropriate. Also the lecture time may include: 1) formal lectures, 2) lecture demonstrations, 3) quizzes, examinations, and other evaluations of student performance, 4) directed reading activities, 5) review of principles and concepts.**
- 2. Lab periods may be devoted to study and review of lecture material as well as evaluations of student performance; however, this time is primarily for students to carry out specific assigned chemistry experiments in the laboratory. Instructor demonstrations of chemical concepts and procedures are also appropriate in the laboratory period.**