

LANEY COLLEGE COURSE OUTLINE

COLLEGE:	LANEY COLLEGE	STATE APPROVAL DATE:	12/20/2018
ORIGINATOR:	Bill Trego	STATE CONTROL NUMBER:	CCC00036 2720
		BOARD OF TRUSTEES APPROVAL DATE:	05/08/2008
		CURRICULUM COMMITTEE APPROVAL DATE:	10/05/2018
		CURRENT EFFECTIVE DATE:	01/01/2019

DIVISION/DEPARTMENT: Laney - Mathematics and Sciences / L - Chemistry

1. REQUESTED CREDIT CLASSIFICATION:

D - Credit - Degree Applicable
N - Not Basic Skills
1 - Program Applicable

2. DEPT/COURSE NO:

CHEM 030B

3. COURSE TITLE:

Introductory Organic and Biochemistry

4. COURSE: Laney Course
Updating

TOP NO. 190500 - Chemistry, General

5. UNITS: 4.000

HRS/WK LEC: 3.00 **Total:** 52.50

HRS/WK LAB: 3.00 **Total:** 52.50

6. NO. OF TIMES OFFERED AS SELETED TOPIC: AVERAGE ENROLLMENT:

7. JUSTIFICATION FOR COURSE:

Satisfies associate degree general education requirement for Natural Science Satisfies requirement for Associate in Science degree Prerequisite for many nursing schools and dental hygiene programs
Acceptable for credit: CSU

8. COURSE/CATALOG DESCRIPTION

Introduction to basic organic chemistry and biochemistry: Hydrocarbons, organic functional groups, nomenclature and reactions, polymers, carbohydrates, proteins, enzymes, lipids, nucleic acids, protein synthesis, and metabolic pathways.

9. OTHER CATALOG INFORMATION

a. Modular: No If yes, how many modules:

b. Open entry/open exit: No

c. Grading Policy: Letter Grade Only

d. Eligible for credit by Exam: No

e. Repeatable according to state guidelines: No

f. Required for degree/certificate (specify):

Associate Of Science in Biology for Transfer, Biomanufacturing, Biomanufacturing Skills, Biomanufacturing Production, Intersegmental General Education Transfer Curriculum (IGETC), California State University General Education (CSU GE Breadth), Science

g. Meets GE/Transfer requirements (specify):

Acceptable for credit: CSU, UC

h. C-ID Number: CHEM 102 Expiration Date: 08/07/2018

i. Are there prerequisites/corequisites/recommended preparation for this course? Yes

Date of last prereq/coreq validation: 10/05/2018

j. Acceptable for Credit: CSU/UC

10. LIST STUDENT PERFORMANCE OBJECTIVES (EXIT SKILLS): (Objectives must define the exit skills required of students and include criteria identified in Items 12, 14, and 15 - critical thinking, essay writing,

problem solving, written/verbal communications, computational skills, working with others, workplace needs, SCANS competencies, all aspects of the industry, etc.)(See SCANS/All Aspects of Industry Worksheet.)

Students will be able to:

1. Categorize types of organic compounds by functional group.
2. Apply IUPAC rules of chemical nomenclature to name alkanes, alkenes, alkynes, derivatives of benzene, alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, amines, and amides.
3. Draw the structures of organic molecules, given the IUPAC names.
4. Predict the products of simple organic reactions.
5. Predict relative boiling points and solubility properties of organic compounds from their structures.
6. Categorize types of biological molecules (carbohydrates, lipids, proteins, and nucleic acids) based on structure.
7. Explain the biological functions of carbohydrates, lipids, proteins, and nucleic acids.
8. Explain and draw the three-dimensional structures of carbohydrates, lipids, proteins, and nucleic acids. Relate their molecular structures to their biological functions.
9. Explain basic biochemical processes, such as enzyme catalysis and inhibition.
10. Calculate the number of ATP molecules formed in the catabolism of various carbohydrates and fats.
11. Explain the basic steps, and identify the major enzymes involved in DNA replication, and protein synthesis.
12. Categorize and explain the type of reaction in each step of glycolysis, lipid metabolism, and the citric acid cycle.
13. Work safely in the organic chemistry laboratory.
14. Analyze the results of laboratory experiments.
15. Realize the value of studying every day, accept the responsibility for the learning process, and expressed that understanding in discussions
16. Write clear, well-organized lab reports; critically analyze and evaluate the results of lab experiments.

11A. COURSE CONTENT: List major topics to be covered. This section must be more than listing chapter headings from a textbook. Outline the course content, including essential topics, major subdivisions, and supporting details. It should include enough information so that a faculty member from any institution will have a clear understanding of the material taught in the course and the approximate length of time devoted to each. There should be congruence among the catalog description, lecture and/or lab content, student performance objectives, and the student learning outcomes. List percent of time spent on each topic; ensure percentages total 100%.

LECTURE CONTENT:

1. Alkanes 7%
 - a. Introduction to organic chemistry
 - b. IUPAC nomenclature
 - c. Drawing formulas
 - d. Structural isomers
 - e. Haloalkanes and cycloalkanes
 - f. Physical properties of alkanes
 - g. Reactions of alkanes: combustion, halogenation
2. Unsaturated Hydrocarbons 7%
 - a. Nomenclature of alkenes and alkynes
 - b. cis-trans isomers
 - c. Reactions of alkenes and alkynes: addition reactions
 - d. Aromatic compounds
3. Alcohols, Phenols, Ethers, and Thiols 7%
 - a. Structure, classification, and naming of alcohols, phenols, and thiols
 - b. Ethers: structure and naming
 - c. Physical properties of alcohols, thiols, and ethers
 - d. Reactions of alcohols: dehydration, oxidation
4. Aldehydes, Ketones, and Chiral Molecules 6%
 - a. Structure and naming
 - b. Physical properties
 - c. Chirality
 - d. Reactions of aldehydes and ketones: oxidation, reduction, addition reactions
5. Carbohydrates 7%
 - a. Classification of monosaccharides

- b. Fischer projections
- c. Structures of glucose, fructose, and galactose (open-chain and cyclic)
- d. Reactions of monosaccharides: oxidation, reduction, acetal formation
- e. Disaccharides
- f. Polysaccharides: starch, cellulose, glycogen
- 6. Carboxylic Acids and Esters 7%
 - a. Structure and nomenclature
 - b. Physical properties
 - c. Acidity of carboxylic acids
- 7. Lipids 7%
 - a. Classification of lipids
 - b. Structures of fatty acids
 - c. Waxes, fats, and oils
 - d. Relative melting points
 - e. Chemical reactions of triacylglycerols: hydrogenation, oxidation, hydrolysis, saponification
 - f. Glycerophospholipid and sphingolipid structure and uses
 - g. Steroids
- 8. Amines and Amides 7%
 - a. Classification and naming
 - b. Physical properties
 - c. Base properties of amines
 - d. Reactions: amidation, hydrolysis
- 9. Amino Acids and Proteins 7%
 - a. Classification of Proteins
 - b. Amino acid structure
 - c. Peptide bond formation
 - d. Levels of protein structure: primary, secondary, tertiary, quaternary
 - e. Protein hydrolysis and denaturation
- 10. Enzymes and Vitamins 8%
 - a. Ways in which enzymes speed up reactions
 - b. Classification of enzymes
 - c. Factors affecting enzyme activity
 - d. Enzyme inhibition
 - e. Regulation of enzyme activity
 - f. Vitamins and cofactors
- 11. Nucleic Acids and Protein Synthesis 8%
 - a. Components and structure of nucleic acids
 - b. Primary structure of DNA and RNA
 - c. DNA double helix structure
 - d. DNA replication
 - e. Types of RNA
 - f. Transcription: synthesis of mRNA
 - g. The genetic code
 - h. Translation: synthesis of proteins
 - i. Genetic mutations
- 12. Metabolic Pathways for Carbohydrates 8%
 - a. Cell structure
 - b. ATP and energy
 - c. Digestion of carbohydrates
 - d. Glycolysis: oxidation of glucose
 - e. Pathways for pyruvate
- 13. Metabolism and Energy Production 8%
 - a. The citric acid cycle (Krebs cycle)
 - b. The electron transport chain
 - c. Oxidative phosphorylation and ATP production
 - d. Determining the total yield of ATP
- 14. Metabolic Pathways for Lipids and Amino Acids 6%
 - a. Digestion of triacylglycerols (fats) and proteins
 - b. Oxidation of fatty acids
 - c. ATP yield of fatty acid oxidation
 - d. Degradation of amino acids

11B. LAB CONTENT:

Laboratory experiments that support the above topics, including quantitative and qualitative experiments and analysis of data.

Laboratory topics include:

- Organic laboratory safety 10%
- Properties of hydrocarbons 5%
- Molecular modeling 10%
- Recrystallization, melting point determination 5%
- Alcohols and phenols 10%
- Aldehydes, ketones, and carboxylic acids 10%
- Synthesis and purification of aspirin 10%
- Amino acids and proteins 10%
- Enzymes 10%
- Carbohydrates 5%
- Lipids 5%
- Preparation of soap 5%
- Vitamins 5%

12. METHODS OF INSTRUCTION (List methods used to present course content.)

1. Observation and Demonstration
2. Other (Specify)
3. Lab
4. Lecture
5. Experiments
6. Activity
7. Individualized Instruction
8. Discussion
9. Distance Education
10. Multimedia Content
11. Threaded Discussions

Other Methods:

In-class discussion and guided problem solving, demonstrations Quizzes and exams that require students to explain their reasoning Comprehensive final exam

13. ASSIGNMENTS: 6.00 hours/week (List all assignments, including library assignments. Requires two (2) hours of independent work outside of class for each unit/weekly lecture hour. Outside assignments are not required for lab-only courses, although they can be given.)

Out-of-class Assignments:

1. Homework assignments from the textbook
2. Laboratory reports that include observations, explanations, and conclusions

ASSIGNMENTS ARE: (See definition of college level):
Primarily College Level

14. STUDENT ASSESSMENT: (Grades are based on):

ESSAY (Includes "blue book" exams and any written assignment of sufficient length and complexity to require students to select and organize ideas, to explain and support the ideas, and to demonstrate critical thinking skills.)

COMPUTATION SKILLS

NON-COMPUTATIONAL PROBLEM SOLVING (Critical thinking should be demonstrated by solving unfamiliar problems via various strategies.)

SKILL DEMONSTRATION

ESSAY (Includes "blue book" exams and any written assignment of sufficient length and complexity to require students to select and organize ideas, to explain and support the ideas, and to demonstrate critical thinking skills.)

15. TEXTS, READINGS, AND MATERIALS

A. Textbooks:

McMurry, et. al. 2017. *Fundamentals of General, Organic, and Biological Chemistry* 8th. Prentice Hall

Rationale: -Text: McMurry, et. al. *Fundamentals of General, Organic, and Biological Chemistry* 6th ed. (San Francisco: Prentice Hall) 2010. ISBN: 0-13-605450-1

Fossum, et al. Laney College. 12-31-2017. *Chemistry 30B Laboratory Manual*. Laney House

*Date is required: Transfer institutions require current publication date(s) within 5 years of outline addition/update.

B. Additional Resources:

Library/LRC Materials and Services:

The instructor, in consultation with a librarian, has reviewed the materials and services of the College Library/LRC in the subject areas related to the proposed new course

Are print materials adequate? Yes

Are nonprint materials adequate? Yes

Are electronic/online resources available? Yes

Are services adequate? Yes

Specific materials and/or services needed have been identified and discussed. Librarian comments: Library requests list of recommended supplementary titles (non-textbook) to support this course.

C. Readings listed in A and B above are: (See definition of college level):

Primarily college level

16. **DESIGNATE OCCUPATIONAL CODE:**

E - Non-Occupational

17. **LEVEL BELOW TRANSFER:**

Y - Not applicable

18. **CALIFORNIA CLASSIFICATION CODE:**

Y - Credit Course

19. **NON CREDIT COURSE CATEGORY:**

Y - Not Applicable, Credit course

20. **FUNDING AGENCY CATEGORY:**

Y - Not Applicable (funding not used to develop course)

SUPPLEMENTAL PAGE

Use only if additional space is needed. (Type the item number which is to be continued, followed by "continued.")

Show the page number in the blank at the bottom of the page. If the item being continued is on page 2 of the outline, the first supplemental page will be "2a." If additional supplemental pages are required for page 2, they are to be numbered as 2b, 2c, etc.)

1a. Prerequisites/Corequisites/Recommended Preparation:

- **PREREQUISITE:**

CHEM 030A: Introductory General Chemistry

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STUDENT LEARNING OUTCOMES

1. **Outcome:** Evaluate the structures of organic and biomolecules, categorize structures by functional group, and construct systematic names for organic molecules.

This outcome maps to the following Institution Outcomes:

- Critical Thinking and Problem Solving - Students will be able to think critically and solve problems by identifying relevant information, evaluating alternatives, synthesizing findings and implementing

effective solutions.

Assessment: Exam Questions

2. **Outcome:** Predict the products of organic and metabolic reactions.

This outcome maps to the following Institution Outcomes:

- Critical Thinking and Problem Solving - Students will be able to think critically and solve problems by identifying relevant information, evaluating alternatives, synthesizing findings and implementing effective solutions.

Assessment: Exam Questions

3. **Outcome:** Use inter/intramolecular forces to predict trends in physical properties of organic compounds and explain the structures of biomolecules.

This outcome maps to the following Institution Outcomes:

- Critical Thinking and Problem Solving - Students will be able to think critically and solve problems by identifying relevant information, evaluating alternatives, synthesizing findings and implementing effective solutions.

Assessment: Exam Questions

4. **Outcome:** Describe biochemical processes such as DNA replication, transcription, translation, and metabolic pathways, and evaluate the interconnections between biochemical pathways.

This outcome maps to the following Institution Outcomes:

- Critical Thinking and Problem Solving - Students will be able to think critically and solve problems by identifying relevant information, evaluating alternatives, synthesizing findings and implementing effective solutions.

Assessment: Exam Questions

5. **Outcome:** Perform laboratory work using standard safety procedures and interpret the results of experiments.

This outcome maps to the following Institution Outcomes:

- Critical Thinking and Problem Solving - Students will be able to think critically and solve problems by identifying relevant information, evaluating alternatives, synthesizing findings and implementing effective solutions.

Assessment: Exam Questions