

Chem 104x Organic and Biochemistry
Spring Session, 2024
A Survey of Organic Chemistry and Biochemistry

Instructor: Dr. Lawrence Duffy
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(WRRB)
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Office hours: 4:30 Monday, Reich 184

Lecture: 201 Reichardt Building 3:30pm
Lab: Reichardt Bldg, TBA

Prerequisites: Placement in ENGL F111X or higher, placement in DEVM F105 or higher, or permission of instructor

Required Course Material: **Text book**, *Introduction to General, Organic, and Biochemistry* 11th edition (authors Bettelheim, Brown, March). A **calculator** capable of scientific notation is also required for this course and should be brought to both class and lab.

Course Description: Fundamentals of organic chemistry and biochemistry as applied to biological systems. This course bridges the gap between a general chemistry course and biochemical concepts of health-related sciences. The course is recommended for health-science degree candidates and non-science majors interested in the central role of biochemistry in life. At UAF, it is a General Education course.

Learning Goals and Outcomes:

- A. Build knowledge of human institutions, sociocultural processes, and the physical natural world through the study of natural and social sciences.
 - Write organic molecular structures
 - Identify functional groups
 - Identify isomer types
 - Describe functions of proteins, carbohydrates and lipids
 - Define glycolysis, TCA cycle and oxidative phosphorylation
 - Define nucleotide synthesis and DNA structure
 - Understand the process of protein synthesis and enzyme function
- B. Develop intellectual and practical skills across the curriculum including inquiry and analysis, critical and creative thinking and problem solving.
 - Observe the complexity of the biochemical and physiological systems and compare to other holistic systems
 - Understand the relationships between individual health and the environment to current issues in society to allow for civic engagement.
 - Understand One Health

Specific Coverage:

- I. Introduction to Organic Chemistry and Functional Groups
- II. Carbohydrates
- III. Classification and Functional Roles of Lipids
- IV. Structure and Function of Proteins
- V. Nucleic Acids, Gene Expression & Protein Synthesis
- VI. Catabolic Pathways and Energy Production
- VII. Food Security and Society
- VIII. Climate Change and Health

Course Goals: This is a general education course. *Structure is Function* is a fundamental theme in science and in the course. Molecular shape determines function. Students who successfully complete this course will have an understanding of the structure and function of molecules that are the building blocks of living systems. Students will develop an appreciation for the relationship between the unique physical and chemical properties of the major classes of biological macromolecules (proteins, lipids, carbohydrates and nucleic acids) and their particular functional roles. Armed with an understanding of the biochemical principles of living systems, students will be more informed consumers and be better prepared to contemplate the relationship between public science policy and human health.

Course Objectives: Chemistry 104 is part of the UAF General Education Curriculum. "The overall goal of the Natural Sciences component of the Core Curriculum is to prepare students for lifelong learning in the natural sciences..." [Faculty Senate Guidelines, 1990]. To partially fulfill this objective, students will, in addition to the specific course coverage outlined above, receive specific instruction on the scientific method, the set of practices that scientists follow to establish cause and effect relationships between variables in a biological system. In addition, students will be given examples of the interplay between scientific knowledge and public policy throughout the course. The purpose of these examples is to encourage students to think about and comment on the impact of scientific knowledge on public policy. For example, how does the scientific literature concerning mercury in fish impact public health policy? Should cigarettes or food be taxed?

Course Policies:

Cell phones/Computers: Use of electronic devices that facilitate learning are permitted. Any other use is prohibited.

Preparation: It is strongly recommended that each student read the portion of the textbook that corresponds to the lecture, before the class begins (see course calendar).

Exams: Makeup exams will be allowed only with pre-approval of the instructor. Acceptable reasons for makeup exams include severe illness, family emergencies or other unavoidable events including dangerous weather conditions and car accidents. Exam format for makeup exams may be different from the original exam. If a make-up exam is approved it must be completed within 1 week of the original exam. Grades will be determined using the plus/minus system.

Final Exam: The final exam will be held during scheduled finals day.

Homework/Quizzes: Some exams and quizzes will be "take home". Quizzes may substitute for exams.

Laboratory Projects: Any projects are intended to explain a core research concept to the class. Projects are intended to spur your creativity.

UAF Attendance Policy:

You are expected to attend classes regularly; unexcused absences may result in a failing grade. You are responsible for conferring with your instructor concerning absences and the possibility of arranging to make up missed work.

Support Services: Support can be obtained through the University of Alaska Library System, online resources, and the instructor. Additional services are available through Student Support Services (<http://www.uaf.edu/sssp/>) at UAF. See page 5.

Disabilities Services:

We will work with the Office of Disabilities Services (<http://www.uaf.edu/disability/>) to provide accommodations for students with disabilities. If you have a disability and require special assistance, please contact the instructor as soon as possible. Students with disabilities must provide a written statement indicating any needed accommodations.

Cheating/Academic Dishonesty: The Chemistry & Biochemistry Department Policy on Cheating is: *"Any student caught cheating will be assigned a course grade of F. The student's academic advisor will be notified of this failing grade and the student will not be allowed to drop the course."* The Department considers performing unauthorized "dry labs" as cheating. Partnering during the lab is acceptable but lab reports must show your own calculations and ideas.

Amending this Syllabus: The instructor may make changes to this syllabus. Any changes will be clearly communicated via email sent to your UAF e-mail account and posted on Blackboard.

Grading:

Lab	100 points
Exams (4)	400 points (100 points each)
Final Exam	100 points
Total	600 points

Course percent grade: (points earned/max total points) x 100

Letter Grade	Percentage Grade
A+	95 - 100
A	90 - 94
A-	89
B+	85 - 88
B	80 - 84
B-	79
C+	75 - 78
C	70 - 74
C-	69
D+	65 - 68
D	60 - 64

Course Plan and Calendar:

Week	Chapter	Topic/Reading Assignment
1	10	Syllabus
1	10	Organic Chemistry-Structural formulas/ isomers
1	10	Organic Chemistry- Functional groups
2	11/12/13	Organic Chemistry- Alkanes, Alkenes, Alkynes, Benzenes
2/3	14/15	Alcohols, and stereoisomers
		Exam 1
4	16/18	Amines and Esters
5	20	Carbohydrates
6	21	Lipids
		Exam 2
7	22	Proteins – Structure & Function
8	23	Enzymes
		Exam 3
9	24	Chemical Communication
10	25	Nucleic Acids, Heredity
11	26	Gene Expression and Protein Synthesis
12	26	Mutations and epigenetics
		Exam 4
13	27	Metabolism
13	27	Bioenergetics/ATP production
13	28	Catabolic Pathways/Gluconeogenesis
14	18	Specific Pathways/ beta oxidation, ketone bodies, carbon skeletons
14	28	Urea cycle and processing of nitrogen
15	29	Biosynthetic pathways
15	29	Fatty Acid Biosynthesis
15	29	Essential Amino Acids and biosynthesis
15	30	Nutrition
16	25	Final Exam (EXAM 5)

Title IX Protection

University of Alaska Board of Regents has clearly stated in BOR Policy that discrimination, harassment and violence will not be tolerated on any campus of the University of Alaska. If you believe you are experiencing discrimination or any form of harassment including sexual harassment /misconduct/assault, you are encouraged to report that behavior. If you disclose sexual harassment or sexual violence to a faculty member or any university employee, they must notify the UAF Title IX Coordinator about the basic facts of the incident.

You may confidentially disclose and access confidential counseling by contacting the UAF Health and Counseling Center at 474-7043.

You may access support and file a Title IX report by contacting the UAF Title IX Coordinator at 474-7599.

You may file a criminal complaint by contacting the University Police Department at 474-7721.

Student Protection and Services Statement:

Every qualified student is welcome in my classroom. As needed, I am happy to work with you, disability services, veterans' services, rural student services, etc. to find reasonable accommodations. Students at this university are protected against sexual harassment and discrimination (Title IX), and minors have additional protections. As required, if I notice or am informed of certain types of misconduct, then I am required to report it to the appropriate authorities. For more information on your rights as a student and the resources available to you to resolve problems, please go to the following site www.uaf.edu/handbook/

Rural Student Services: <https://uaf.edu/ruralss/>

Military and Veteran Services: <https://uaf.edu/veterans/>

UAF Writing Center: <http://uaf.edu/english/writing-center/>

Office of Diversity and Equal Opportunity

University of Alaska Board of Regents have clearly stated in BOR Policy that discrimination, harassment and violence will not be tolerated on any campus of the University of Alaska. If you believe you are experiencing discrimination or any form of harassment including sexual harassment/misconduct/assault, you are encouraged to report that behavior. If you disclose sexual harassment or sexual violence to a faculty member or any university employee, they must notify the UAF Title IX Coordinator about the basic facts of the incident. Your choices for disclosure include:

1. You may confidentially disclose and access confidential counseling by contacting the UAF Health and Counseling Center at 474-7043.
2. You may access support and file a Title IX report by contacting the UAF Title IX Coordinator at 474-7599.
3. You may file a criminal complaint by contacting the University Police Department at 474-7721.

HONOR CODE: Students are expected to read, understand and adhere to the UAF academic honor code as detailed in the UAF Catalog.

DISABILITIES: The instructor will work with the Office of Disabilities Services (ODS) to provide reasonable accommodation to students with disabilities. Students with a physical or learning disability need to identify themselves to ODS in order to request special accommodations. Documentation needs to be provided by the student to ODS, which will notify the instructor of special requirements required for completing the course.

CHEATING: ANY STUDENT CAUGHT CHEATING WILL BE ASSIGNED A GRADE OF "F". The student's academic advisor will be notified of the failing grade.

COVID-19 POLICY: Students should keep up-to-date on the University's policies, practices and mandates related to COVID-19 by regularly checking this UAF website:

<https://sites.google.com/alaska.edu/coronavirus/uaf/uaf-students?authuser=0>

Students are expected to adhere to the university's policies, practices and mandates. Students are subject to disciplinary actions if they do not comply.

STUDENT PROTECTIONS POLICY: UAF EMBRACES A CULTURE OF RESPECT, DIVERSITY, INCLUSION AND CARING.

Students at UAF are protected against sexual harassment and discrimination (Title IX). Faculty members are designated as responsible employees which means they are required to report sexual misconduct. Graduate teaching assistants do NOT share the same reporting obligations. As a student, UAF provides resources available to you.

For more information on your rights go to the following site:

<https://catalog.uaf.edu/academics-regulations/students-rights-responsibilities/>.

ATTENDANCE POLICY:

You are responsible for conferring with your instructor concerning absences and the possibility of arranging to make up missed work.

If you are required to participate in (a) military, (b) UAF-sponsored activity or (c) health or family emergency notify your instructor as soon as possible of your absence.

Your instructor will make a good faith effort to make suitable arrangements to help you make up classes. You will not be penalized for excused absences. You will have the potential to withdraw from the course without academic penalty depending on the situation and timing.

Your instructor is under no obligation to allow you to make up missed work for unexcused absences. Students are encouraged to read the UAF catalog for policy details and procedures.

NOTES ON SYLLABUS AND UNIVERSITY POLICIES

- 1. UAF is an AA/EQ employer and educational institution and prohibits illegal discrimination against any individual.**
- 2. This course follows the UAF policy Incomplete Grade Policy.**
The letter "I" is a temporary grade used to indicate that the student has satisfactorily completed (C or better) the majority of the courses work, but for personal reasons beyond the student's control has not been to complete the course during the regular semester.
Negligence or indifference are not acceptable reasons for an "I" grade
- 3. UAF "C" grade policy.**
"C-" grade is not the same as a C for this course.
- 4. Speaking Center is available (807-474-5470)**
- 5. Writing Center is available (807-474 -5314)**
- 6. Developmental MATH lab is available in the Gruening BLDG.**
- 7. UAF has information and resources on the ACADEMIC ADVISING RESOURCES LIST.**
- 8. EMERGENCY NOTIFICATION PLAN. (see student handbook)**
 - a. In class by instructor as a relay**
 - b. via phone and email**
- 9. Extended Absence Policy (see Student Handbook)**
 - a. Personal illness or injury**
 - b. bereavement**
 - c. military obligations**
 - d. Jury service**
 - e. Serious illness of family or friend**
 - f. other emergencies**
- 10. Technical Requirements**
 - a. Access to textbook**
 - b. Access to Internet**
 - c. access to a computer**
 - d. access to a phone****Students need a computer for online course material and the ability to upload or download material.**

Student protections and services statement: Every qualified student is welcome in my classroom. As needed, I am happy to work with you, disability services, veterans' services, rural student services, etc to find reasonable accommodations. Students at this university are protected against sexual harassment and discrimination (Title IX), and minors have additional protections. As required, if I notice or am informed of certain types of misconduct, then I am required to report it to the appropriate authorities. For more information on your rights as a student and the resources available to you to resolve problems, please go the following site:

www.naf.edu/handbook/ OR GRADUATE STUDENT VERSION: Student protections and services statement: Every qualified student is welcome in my classroom. As needed, I am happy to work with you, disability services, veterans' services, rural student services, etc to find reasonable accommodations. Students at this university are protected against sexual harassment and discrimination (Title IX), and minors have additional protections. For more information on your rights as a student and the resources available to you to resolve problems, please go the following site: www.naf.edu/handbook/