2020

Biochemistry I

North Carolina Agricultural and Technical State University

NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY

COURSE SYLLABUS

College Name: College of Science and Technology

Department Name: Department of Chemistry

Course Name: Biochemistry I

COURSE INFORMATION

- Course Number/Section: CHEM 451
- Term:
- Semester Credit Hours: 3
- Times and Days:
- Class Location:

INSTRUCTOR CONTACT INFORMATION

- Instructor:
- Office Location:
- Office Phone:
- Email Address:

Faculty must notify students of the approximate time and method they can expect to receive an answer to all communications (e.g., email, phone, course messages). Excluding holidays, the response should be provided within 48 hours.

If there's a graduate teaching assistant assigned to work with this course, please include their names also.

STUDENT HOURS

These are times students may visit the professor without an appointment to request the assistance they need.

NOTE: Students are responsible for reading, understanding, and following the syllabus.

: AM ☐ / PM ☐ – : AM ☐ / PM ☐

Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐

COURSE PREREQUISITES

CHEM 222, Minimum Grade of C, which may not be taken concurrently, AND BIOL 100/BIOL 101, Minimum Grade of C, which may not be taken concurrently.

COURSE DESCRIPTION

Biochemistry I is an undergraduate level introductory course designed to emphasize the fundamental and basic concepts of biological chemistry. Topics will include acid-base properties of amino acids, protein structure and function, kinetic analyses of enzymatic reactions and isolation and characterization of biomolecules, nucleotides and nucleic acids, DNA-based technologies, fatty acids. In addition to lectures and discussions, problem sets will be assigned in order to equip students with an understanding of basic biochemical principles and to promote critical thinking and problem-solving skills.

STUDENT LEARNING OBJECTIVES/OUTCOMES (SLO)

Learning outcomes should be specific, measurable, and focused on the content knowledge the students are expected to master and not what the faculty will teach.

If the course is a General Education Course, the SLO should be listed and labeled as "General Education."

SLO 1: Students will demonstrate the ability to employ critical thinking skills in written reports and oral presentations on current biochemical and biomedical topics.
SLO 2: Students will demonstrate the ability to relate ideas and concepts from chemistry, biology, and mathematics to the application of biochemistry concepts.
SLO 3: Students will demonstrate the ability to use analytical thinking skills to evaluate information on biochemistry experiments.
SLO 4: Students will demonstrate their understanding of basic biochemical processes, phenomena, and principles.

REQUIRED TEXTBOOKS AND MATERIALS

Any course-level subscriptions and tools linked in Blackboard Learn learning management system (LMS) should be listed here. The Blackboard LMS must have links to their student data privacy statement.

REQUIRED TEXTS:

Nelson, D. L., Cox, M. M., & Lehninger, A. L. (2019). *Lehninger principles of biochemistry*. New York, NY : W.H. Freeman and Company

REQUIRED MATERIALS:

SUGGESTED COURSE MATERIALS

SUGGESTED READINGS/TEXTS:

SUGGESTED MATERIALS:

GRADING POLICY

ASSIGNMENTS AND GRADING POLICY

94% and above	A		76% - 74%	C
93% - 90%	A-		73% - 70%	C-
89% - 87%	B+		69% - 67%	D+
86% - 84%	B		66% - 64%	D
83% - 80%	B-		63% - 0%	F
79% - 77%	C+			

For GRADUATE COURSES: See 2019-2020 Graduate Catalog p.38 for graduate grading scale and Non-Graded Courses

GRADING ALLOCATION

Course grades are based on a weighted grading scale of 100%. The breakdown for the course is as follows: *[Faculty, please adjust according to your course.]*

Category	# of Activities	Percentage Grade Weight
Discussion Board	15	6
Reading Quiz	10	10
Homework	11	14
Exams	3	30
Final Exam	1	20
Research Presentation	1	10
Review Quizzes	5	10
Total	**46**	**100%**

COURSE POLICIES

USE OF BLACKBOARD AS THE LEARNING MANAGEMENT SYSTEM

Blackboard is the primary online instructional and course communications platform. Students can access the course syllabus, assignments, grades, and learner support resources. Students are encouraged to protect their login credentials, complete a Blackboard orientation, and log in daily to the course.

Note: Uploading assignments through Blackboard presents a challenge for Chromebook users in locating the files for submission. If you use a Chromebook, please be sure you also have access to a Mac computer or Windows computer so you can fully participate in your Blackboard class. For more information about student computer recommendations, please visit https://hub.ncat.edu/administration/its/computer-recommendations.php.

MAKE-UP EXAMS

See << Update Academic Year >>*Undergraduate Bulletin:*

https://www.ncat.edu/provost/academic-affairs/bulletins/index.php

For GRADUATE STUDENTS: See 2019-20 Graduate Catalog p. 54

EXTRA CREDIT

LATE WORK

SPECIAL ASSIGNMENTS

For GRADUATE STUDENTS: FAILING TO MEET COURSE REQUIREMENTS (Graduate Catalog p.40)

For GRADUATE STUDENTS: CLASS ATTENDANCE (see 2019-20 Graduate Catalog p. 53-54)

Students are expected to attend class and participate on a regular basis in order to successfully achieve course learning outcomes and meet federal financial aid requirements (34 CFR 668.22). Class attendance in online courses is defined as active participation in academically-related course activities. Active participation may consist of course interactions with the content, classmates, and/or the instructor. Examples of academically-related course activities include, but are not limited to:

- Completing and submitting assignments, quizzes, exams, and other activities within Blackboard or through Blackboard (3rd-party products).
- Participating in course-related synchronous online chats, discussions, or meeting platforms such as Blackboard Collaborate in which participation is tracked.

CLASSROOM CITIZENSHIP

Courtesy, civility, and respect must be the hallmark of your interactions.

COMPLIANCE WITH THE AMERICANS WITH DISABILITIES ACT

North Carolina A&T State University is committed to following the requirements of the Americans with Disabilities Act Amendments Act (ADAAA) and Section 504 of the Rehabilitation Act.
If you need an academic accommodation based on the impact of a disability, you must initiate the request with the Office of Accessibility Resources (OARS) and provide documentation in accordance with the Documentation Guidelines at N.C. A&T. Once documentation is received, it will be reviewed. Once approved, you must attend a comprehensive meeting to receive appropriate and reasonable accommodations. If you are a student registered with OARS, you must complete the Accommodation Request Form to have accommodations sent to faculty.

OARS is located in Murphy Hall, Suite 01 and can be reached at 336-334-7765, or by email at accessibilityresources@ncat.edu. Additional information and forms can be found on the internet at https://www.ncat.edu/provost/academic-affairs/accessibility-resources/index.php.

Please note: Accommodations are not retroactive and begin once the Disability Verification Form is provided to faculty.

TITLE IX

North Carolina A&T State University is committed to providing a safe learning environment for all students—free of all forms of discrimination and harassment. Sexual misconduct and relationship violence in any form are inconsistent with the university's mission and core values, violates university policies, and may also violate federal and state law. Faculty members are considered "Responsible Employees" and are required to report incidents of sexual misconduct and relationship violence to the Title IX Coordinator. If you or someone you know has been impacted by sexual harassment, sexual assault, dating or domestic violence, or stalking, please visit the Title IX website to access information about university support and resources. If you would like to speak with someone confidentially, please contact Counseling Services at 336-334-7727 or the Student Health Center at 336-334-7880.

TECHNICAL SUPPORT

If you experience any problems with your A&T account, you may call Client Technology Services (formerly Aggie Tech Support and Help Desk) at 336-334-7195, or visit https://hub.ncat.edu/administration/its/dept/ats/index.php.

FIELD TRIP POLICIES / OFF-CAMPUS INSTRUCTION AND COURSE ACTIVITIES

If applicable:

Off-campus, out-of-state, foreign instruction, and activities are subject to state law and university policies and procedures regarding travel and risk-related activities. Information regarding these rules and regulations may be found at https://www.ncat.edu/campus-life/student-affairs/index.php.

STUDENT HANDBOOK

https://www.ncat.edu/campus-life/student-affairs/departments/dean-of-students/student-handbook.php

STUDENT TRAVEL PROCEDURES AND STUDENT TRAVEL ACTIVITY WAIVER

https://hub.ncat.edu/administration/student-affairs/staff-resources/studen_activity_travel_waiver.pdf

OTHER POLICIES *(e.g., Copyright Guidelines, Confidentiality, etc.)*

STUDENT HANDBOOK

https://www.ncat.edu/campus-life/student-affairs/departments/dean-of-students/student-handbook.php

Graduate Catalog

SEXUAL MISCONDUCT POLICY

https://www.ncat.edu/legal/title-ix/sexual-harassment-and-misconduct-policies/index.php

FAMILY EDUCATIONAL RIGHTS AND PRIVACY ACT (FERPA)

https://www.ncat.edu/registrar/ferpa.php

STUDENT COMPLAINT PROCEDURES

https://www.ncat.edu/current-students/student-complaint-form.php

STUDENT CONDUCT AND DISCIPLINE

North Carolina A&T State University has rules and regulations that govern student conduct and discipline meant to ensure the orderly and efficient conduct of the educational enterprise. It is the responsibility of each student to be knowledgeable about these rules and regulations.

Please consult the following about specific policies such as academic dishonesty, cell phones, change of grade, disability services, disruptive behavior, general class attendance, grade appeal, incomplete grades, make-up work, student grievance procedures, withdrawal, etc.:

- Undergraduate Bulletin
  https://www.ncat.edu/provost/academic-affairs/bulletins/index.php
- Graduate Catalog
  https://www.ncat.edu/tgc/graduate-catalog/index.php
- Student Handbook
  https://www.ncat.edu/campus-life/student-affairs/departments/dean-of-students/student-handbook.php

ACADEMIC DISHONESTY POLICY

Academic dishonesty includes but is not limited to the following:

1. Cheating or knowingly assisting another student in committing an act of cheating or other academic dishonesty;
2. Plagiarism (unauthorized use of another's words or ideas as one's own), which includes but is not limited to submitting exams, theses, reports, drawings, laboratory notes or other materials as one's own work when such work has been prepared by or copied from another person;
3. Unauthorized possession of exams or reserved library materials; destroying or hiding source, library or laboratory materials or experiments or any other similar actions;
4. Unauthorized changing of grades, or marking on an exam or in an instructor's grade book or such change of any grade record;
5. Aiding or abetting in the infraction of any of the provisions anticipated under the general standards of student conduct;
6. Hacking into a computer and gaining access to a test or answer key prior to the test being given. N.C. A&T reserves the right to search the emails and computers of any student suspected of such computer hacking (if a police report of the suspected hacking was submitted prior to the search); and
7. Assisting another student in violating any of the above rules.

A student who has committed an act of academic dishonesty has failed to meet a basic requirement of satisfactory academic performance. Thus, academic dishonesty is not only a basis for disciplinary action, but may also affect the evaluation of a student's level of performance. Any student who commits an act of academic dishonesty is subject to disciplinary action.

In instances where a student has clearly been identified as having committed an act of academic dishonesty, an instructor may take appropriate disciplinary action, including loss of credit for an assignment, exam, or project; or awarding a grade of "F" for the course, **subject to review and endorsement by the chairperson and dean**.

For GRADUATE STUDENTS: Reference for academic dishonesty – 2010-2020 Graduate Catalog, p.58-59

For GRADUATE STUDENTS: STUDENT RELIGIOUS OBSERVANCE (see Graduate Catalog, p.55)

ASSIGNMENTS AND ACADEMIC CALENDAR

Include topics, reading assignments, due dates, exam dates, withdrawal dates, pre-registration and registration dates, all holidays, and convocations.*

THE WEEK OF MM/DD/YY	SUBJECT	UNIT LEARNING OUTCOMES (ULO)	READING IN TEXT, ACTIVITY, HOMEWORK, EXAM
	Unit 1:Introduction	ULO 1: Know the learning objectives of the course. (SLO 1) ULO 2: Understand the syllabus, grade distribution, and course expectations. (SLO 1)	1. **Read:** Syllabus 2. **Complete:** Discussion #1 (ULO 1-2)
	Unit 2:Water and pKa	ULO 1: Describe four types of non-covalent interactions, how week acids and bases behave in water. (SLO 2) ULO 2: Understand how buffer systems work and design buffer making. (SLO 2) ULO 3: Explain the polarity of a molecule. (SLO 2)	1. **Read Textbook:** Nelson, D. L., Cox, M. M., & Lehninger, A. L. (2019). *Lehninger principles of biochemistry*. New York, NY : W.H. Freeman and Company a. Chapter 2: Water and Aqueous Solutions Page 47-64 2. **Complete:** Reading Assignment (ULO 1) 3. **Complete:** Homework (ULO 1) 4. **Complete:** Review quiz (ULO 1) 5. **Complete:** Discussion Board#2 (ULO 1)
	Unit 3:Amino Acid and Peptide Bond	ULO 1: Name and draw the structures of amino acids. (SLO 2,4)	1. **Read Textbook:** Nelson, D. L., Cox, M. M., & Lehninger, A. L. (2019). *Lehninger principles of biochemistry*. New York, NY : W.H. Freeman and Company a. Chapter 3 (Page 76-89)

		ULO 2: Explain the properties of peptides. (SLO 2,4) ULO 3: Evaluate the ionization behavior of amino acids and peptides. (SLO 2,4)	2. **Complete:** Reading Assignment (ULO 1) 3. **Complete:** Homework (ULO 1) 4. **Complete:** Review quiz (ULO 1) 5. **Complete:** Discussion Board#3 (ULO 1)
	Unit 4:Protein Structure	ULO 1: Understand four levels of protein structures. (SLO 1-2) ULO 2: Explain protein function based on structures. (SLO 1-2) ULO 3: Describe protein folding and denaturation. (SLO 1-2)	1. **Read Textbook:** Nelson, D. L., Cox, M. M., & Lehninger, A. L. (2019). *Lehninger principles of biochemistry*. New York, NY : W.H. Freeman and Company a. Chapter 4: Pages 115-127,143-147 2. **Complete:** Reading Assignment (ULO 1-3) 3. **Complete:** Homework (ULO 1-3) 4. **Complete:** Review quiz (ULO 1-3) 5. **Complete:** Discussion Board#4 (ULO 1-3)
	Unit 5: Protein Function –1	ULO 1: Understand how protein structure relates to protein function. (SLO 2-4) ULO 2: Describe the binding cooperativity. (SLO 2-4) ULO 3: Explain how the myoglobin and haemoglobin protein work with biochemistry terms. (SLO 2-4)	1. **Read Textbook:** Nelson, D. L., Cox, M. M., & Lehninger, A. L. (2019). *Lehninger principles of biochemistry*. New York, NY : W.H. Freeman and Company a. Chapter 4: (Pages 157-167,170-171) 2. **Complete:** Reading Quiz (ULO 1-3) 3. **Complete:** Homework (ULO 1-3) 4. **Complete:** Review Quiz (ULO 1-3) 5. **Complete:** Exam #1 (ULO 1-3) 6. **Complete:** Discussion Board#5 (ULO 1-3)
	Unit 6:Protein techniques	ULO 1: Evaluate purification methods based on the protein mixture property. (SLO 2-4) ULO 2: Explain the mechanism of protein	1. **Read Textbook:** Nelson, D. L., Cox, M. M., & Lehninger, A. L. (2019). *Lehninger principles of biochemistry*. New York, NY : W.H. Freeman and Company a. Chapter 3: Pages 89-96

		analysis methods. (SLO 2-4) ULO 3: Evaluate purification analysis methods. (SLO 2-4)	2. **Complete:** Homework #5 (ULO 1-3) 3. **Complete:** Discussion Board#6 (ULO 1-3)
	Unit 7:Enzyme mechanism	ULO 1: Understand the concept of how enzyme works. (SLO 1-4) ULO 2: Describe the enzyme mechanism of chymotrypsin and lysozyme. (SLO 1-4) ULO 3: Explain how enzymes accelerate chemical reactions. (SLO 1-4)	1. **Read Textbook:** Nelson, D. L., Cox, M. M., & Lehninger, A. L. (2019). *Lehninger principles of biochemistry*. New York, NY : W.H. Freeman and Company a. Chapter 6: Pages 189-199 2. **Complete:** Reading Quiz (ULO 1-3) 3. **Complete:** Homework (ULO 1-3) 4. **Complete:** Discussion Board#7 (ULO 1-3)
	Unit 8:Enzyme kinetics	ULO 1: Explain the concept of enzyme kinetics with the key terms. (SLO 1-4) ULO 2: Understand the enzyme kinetics steady state. (SLO 1-4) ULO 3: Calculate the enzyme reaction rate and catalytic turnover. (SLO 1-4)	1. **Read Textbook:** Nelson, D. L., Cox, M. M., & Lehninger, A. L. (2019). *Lehninger principles of biochemistry*. New York, NY : W.H. Freeman and Company a. Chapter 6: Pages 200-208 2. **Complete:** Reading Quiz (ULO 1-3) 3. **Complete:** Homework (ULO 1-3) 4. **Complete:** Discussion Board#8 (ULO 1-3)
	Unit 9:Enzyme Inhibition	ULO 1: Explain irreversible and reversible inhibitors. (SLO 1-4) ULO 2: Describe competitive inhibition and uncompetitive inhibition. (SLO 1-4) ULO 3: Explain competitive inhibition with a Michaelis-Menten plot. (SLO 1-4)	1. **Read Textbook:** Nelson, D. L., Cox, M. M., & Lehninger, A. L. (2019). *Lehninger principles of biochemistry*. New York, NY : W.H. Freeman and Company a. Chapter 6 pp. 215–218 2. **Complete:** Reading Quiz (ULO 1-3) 3. **Complete:** Homework (ULO 1-3) 4. **Complete:** Exam #2 (ULO 1-3) 5. **Complete:** Discussion Board #9 (ULO 1-3)

	Unit 10:Nucleotides and Nucleic Acids	ULO 1: Explain the biological function of nucleotides and nucleic acids. (SLO 1-4) ULO 2: Describe the structures of common nucleotides. (SLO 1-4) ULO 3: Evaluate the chemistry of nucleic acids and mutagenesis. (SLO 1-4)	1. **Read Textbook:** Nelson, D. L., Cox, M. M., & Lehninger, A. L. (2019). *Lehninger principles of biochemistry*. New York, NY : W.H. Freeman and Company a. Chapter 8 pp. 281–301 2. **Read:** Student Presentation Guidelines 3. **Complete:** Reading Quiz #6 (ULO 1-3) 4. **Complete:** Homework #7 (ULO 1-3) 5. **Complete:** Review Quiz #5 (ULO 1-3) 6. **Complete:** Discussion Board #10 (ULO 1-3)
	Unit 11:Carbohydrates	ULO 1: Draw the structures of monosaccharides. (SLO 1-4) ULO 2: Describe the biological function of polysaccharides. (SLO 1-4) ULO 3: Demonstrate open chain and ring forms of monosaccharides. (SLO 1-4)	1. **Read Textbook:** Nelson, D. L., Cox, M. M., & Lehninger, A. L. (2019). *Lehninger principles of biochemistry*. New York, NY : W.H. Freeman and Company a. Chapter 7 pp. 243–267 2. **Complete:** Reading Quiz #7 (ULO 1-3) 3. **Complete:** Homework #7 (ULO 1-3) 4. **Complete:** Discussion Board #11 (ULO 1-3)
	Unit 12:Lipids	ULO 1: Explain the biological roles of lipids. (SLO 4) ULO 2: Describe the structure of different types of lipids. (SLO 1-4) ULO 3: Describe the property and functions of lipids. (SLO 1-4)	1. **Read Textbook:** Nelson, D. L., Cox, M. M., & Lehninger, A. L. (2019). *Lehninger principles of biochemistry*. New York, NY : W.H. Freeman and Company a. Chapter 10 pp. 357–370 2. **Complete:** Reading Quiz #8 (ULO 1-3) 3. **Complete:** Homework #8 (ULO 1-3) 4. **Complete:** Exam #3 (ULO 1-3) 5. **Complete:** Discussion Board #12 (ULO 1-3)
	Unit 13:Glucose Utilization	ULO 1: Explain the energy from glucose via glycolysis. (SLO 1-4)	1. **Read Textbook:** Nelson, D. L., Cox, M. M., & Lehninger, A. L. (2019). *Lehninger principles of biochemistry*. New York, NY : W.H. Freeman and Company

		ULO 2: Describe the reactions in the glycolysis pathway. (SLO 1-4) ULO 3: Describe the gluconeogenesis pathway and pentose phosphate pathway. (SLO 1-4)	a. Chapter 14 pp. 543–555, 563–564, 568–573 2. **Complete:** Reading Quiz #9 (ULO 1-3) 3. **Complete:** Homework #9 (ULO 1-3) 4. **Complete:** Discussion Board#13 (ULO 1-3)
	Unit 14:Citric Acid Cycle	ULO 1: Explain cellular respiration. (SLO 1-4) ULO 2: Describe the reactions of the citric acid cycle. (SLO 1-4) ULO 3: Describe the regulations of the citric acid cycle. (SLO 1-4)	1. **Read Textbook:** Nelson, D. L., Cox, M. M., & Lehninger, A. L. (2019). *Lehninger principles of biochemistry*. New York, NY : W.H. Freeman and Company a. Chapter 16 pp. 633–651 2. **Complete:** Reading Quiz #10 (ULO 1-3) 3. **Complete:** Homework #10 (ULO 1-3) 4. **Complete:** Discussion Board #14 (ULO 1-3)
	Unit 15:Student Presentations	ULO 1: Give student presentations. (SLO 1-4)	1. **View and Listen:** Students Presentations (ULO 1-3) 2. **Complete:** Final Exam (ULO 1-3)

** These descriptions and timelines are subject to change at the discretion of the instructor.*