



DEPARTMENT OF BIOCHEMISTRY

BCHM 22100 – Analytical Biochemistry

3.00 Credit Hours
Spring 2026

COURSE INFORMATION

- **Course number and title:** BCHM 22100-Analytical Biochemistry
- **CRN 11811 (lecture), 13204 (lab), 10478 (lab), 40679 (lab)**
- **Instructional modality: Face-to-Face**
- **Course Credit hours:** 3
- **Course Brightspace pages: (lecture 001 for Kaltura/Boilercast, Lab 004 for other course materials)**

Office hours:

Instructors and TAs offer office hours by appointment. Students can receive assistance with problem sets and lab reports during recitation sessions.

COURSE DESCRIPTION

The main goals of this course are to introduce students to small biological molecules that function independently or serve as precursors to larger macromolecules. The structure and function of these molecules will be demonstrated by observing their separation properties and chemical reactivity.

Discussion of qualitative and quantitative analysis of biological compounds and controls, including pH measurement, spectrophotometry, the theoretical basis of various separation techniques, and application of these methods to separation and analysis of biological compounds. Laboratory sessions will provide practical experience with these methods. This course is designed for biochemistry majors.

For each 2-week module, the first week will focus on practicing the method, learning about it, and setting up for the forensic analysis week. Case information can also be presented, discussed, and used for planning, time permitting, during the first week. The second week will be dedicated to collecting data on samples, interpreting results, and reaching conclusions for the case.

Principles and theories of techniques will be introduced in lecture sessions, followed by their practical application in laboratory sessions. Methods may include chemical fractionation, thin-layer chromatography, spectrophotometry, ELISA assays, and HPLC. Basic lab skills and concepts will be reinforced, and the scientific method will be integrated into lab exercises. Students will develop proper scientific communication skills by writing lab reports. These objectives are essential for developing scientific expertise.

LEARNING OUTCOMES

BCHM 22100 students will acquire laboratory skills. They will perform a wide variety of biochemical and molecular techniques, with an understanding of the principles underlying these methods. They will be able to perform standard laboratory calculations.

BCHM 22100 students will demonstrate knowledge of the scientific method. They will understand the concepts and importance of hypotheses, experimental design for hypothesis testing, and data analysis in generating new knowledge.

BCHM 22100 students will acquire information literacy: the ability to locate, evaluate, and use information in biochemistry and molecular biology, as required for research, data analysis, and communication.

BCHM 22100 students will communicate scientific knowledge, experimental results, and conclusions effectively in writing.

LEARNING RESOURCES, TECHNOLOGY, AND TEXTS

There is no required textbook for the course.

Every week, an electronic version of the experiment handout will be available on the course Brightspace page.

Sometimes, you will be directed to websites or given additional reading materials related to the labs. Some extra reading may also be posted on the course Brightspace page.

BRIGHTSPACE

The course syllabus, lecture notes, lab instructions, Boilercast recordings, and other materials will be accessible through the Purdue University Brightspace site at <https://purdue.brightspace.com>.

ASSIGNMENTS

Your learning will be assessed through exams, quizzes, problem sets, and laboratory reports. Details on these assignments and exams will be posted on Brightspace.

Problem sets:

Problem sets will be distributed throughout the semester via Brightspace, and Problem sessions will be held on the scheduled Wednesdays, as announced. Problem sets are due according to the schedule and will NOT be accepted after the deadline. Each problem set is worth 6 points toward the final grade. Completing these problems will provide students with practice in completing laboratory calculations and opportunities to think critically about experimental design. Students can receive help on problem sets and lab reports during the Problem set sessions.

Quizzes:

A 5-minute in-lab quiz will be given immediately before each lab session to assess student comprehension of the lab handout.

Lab Reports:

Written laboratory reports describing the lab exercise and the collected results will be submitted via Brightspace. Each report will contribute 30 points to the final grade. Reports will be graded using a rubric available to students on Brightspace. Students will collaborate in teams to collect data, but each will write their own report independently. Students can use Turnitin in Brightspace to review their reports before final submission to ensure originality. If the instructor determines that a report contains plagiarism, a score of zero will be assigned. If two reports are plagiarized, a failing grade will be assigned for the semester. Reports must be submitted on Brightspace by the start of the next lab session. If you are late submitting a report, you MUST contact Professor Gowher before the deadline to request an extension. Extensions are not guaranteed for late submissions.

All lab reports are expected to include the following:

1. Title page/Overall organization- the lab exercise title, your name, and your lab partners' names.
2. Introduction - Briefly describe the experiment performed and its purpose. Include a hypothesis statement outlining what you expect to observe. This section should be no more than 1-2 paragraphs, double-spaced, 12-point font.
3. Student Data Recording Sheet: Present the data requested in the lab handout in a clear and organized way.
4. Summary Questions: Answer summary questions on the data recording sheet in a clear and concise manner
5. Discussion – Provide a concise analysis of the results using the discussion prompt questions in the data recording sheet.

There is no lab notebook required for this course

Exams:

There will be an in-class midterm and final exams. The final exam is not cumulative and will occur during the last week of classes. Some exam questions will require students to apply their skills in performing laboratory calculations. Make-up exams will be provided at the instructor's discretion.

If you have any questions about the grading of lab reports or exams, please submit the paper to the teaching assistant. Requests (and reasons) for re-grades must be submitted in writing no later than the end of the second class period after the graded exam or lab report has been returned.

Assessment	Due	Total Points	% of grade
Quizzes	Each lab	35	5%
Problem sets	Various	35	6.6%
Midterm Exam	Feb. 27	90	15%
Final Exam	April 24	90	15%
7 Lab Reports	Bi Weekly	350	60%
Total		600	100%

GRADING SCALE

The cutoff values for letter grades are as follows (no +/- scores are given):

90%	A
80%	B
70%	C
60%	D
59% or below	F

"Between the beginning of the 5th and the end of the 7th week, all students enrolled in 10000-29999 level and those approved for foundational courses shall be provided graded feedback by their faculty. These grades will not become part of the permanent record."

According to the [Grades and Grade Reports](#) section of Academic Regulations, "A grade of incomplete (I) is a record of work interrupted by unavoidable absence or other causes beyond a student's control..." Further details on these circumstances and the process for assigning types of incompletes are outlined in the regulations. Please contact me as soon as you think an incomplete might be needed in this course before final course grades are due.

EXTRA CREDIT

There will be no opportunity for extra credit.

OBTAINING EXTRA HELP

Most Wednesday Recitation sessions are help sessions.

Professor Gowher will be available to answer your questions in person or online (by appointment) or by email.

TAs will meet students by appointment.

If you want to be a successful student:

- Be self-motivated and self-disciplined.
- Be willing to speak up if problems arise.
- Access the resources that are available to you; reaching out for assistance is a critical life skill rather than an indication of weakness.
- Be willing and able to commit to 4 to 15 hours per week per course.
- Be able to communicate through writing.
- Be able to meet the minimum requirements for the course.
- Accept critical thinking and decision making as part of the learning process.
- Take advantage of resources such as those listed in our course Brightspace under Announcements regarding Technology, Academics, Campus Resources, etc.
- Review the University Policies content on our course Brightspace.

In contrast, here are some common behaviors that lead to failing the course.

- Delay reading until the night before the discussion.
- Wait until the last day to begin assignments.
- Forget about deadlines.
- Ignore emails from the instructor and/or your peers regarding course activities.
- Don't get familiar with the course on Brightspace and the syllabus.

CLASS ATTENDANCE

Students are expected to be present for every laboratory session. Attendance will be taken at the beginning of each laboratory session, and lateness will be noted. Unexcused absences from a laboratory session will result in a grade of 0 for the lab. When conflicts or absences can be anticipated, such as for many University-sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency absences when advance notification to the instructor is not possible, the student should contact the instructor as soon as possible by email or phone. When the student is unable to make direct contact with the instructor and is unable to leave a message with the instructor's department because of circumstances beyond the student's control, and in cases falling under excused absence regulations, the student or the student's representative should contact or go to the [Office of the Dean of Students website](#) to complete appropriate forms for instructor notification. Under academic regulations, excused absences may be granted for cases of grief/bereavement, military service, jury duty, parenting leave, or emergent or urgent medical care. For details, see the [Academic Regulations & Student Conduct section](#) of the University Catalog website.

From the Provost's office:

In certain laboratory-based or intensive short-term courses, a student can jeopardize their academic standing through an unreasonable number of absences, particularly in laboratory courses that cannot be made up later. **In courses with extensive laboratory exercises, group projects, group performances, or participation requirements, equivalent exercises or assessments may not be possible as determined by the instructor and subject to review by the Dean of the school or college offering the course, or their designee.** In such a case, the student may be eligible for retroactive withdrawal. The student should always consult with the instructor to determine the potential impact of any absence.

ACADEMIC GUIDANCE IN THE EVENT A STUDENT IS QUARANTINED/ISOLATED

If you must miss class at any point in time during the semester, please reach out to me via email so that we can communicate about how you can maintain your academic progress. If you find yourself too sick to progress in the course, notify me via email or

Brightspace. This notification does not guarantee you will be able to continue in the course. Please note how Purdue intends to handle positive cases:

<https://protect.purdue.edu/updates/protect-purdue-updates-for-the-spring-2023-semester/>

ACADEMIC INTEGRITY

Academic misconduct of any kind will not be tolerated in any course offered by the Department of Biochemistry. Information on Purdue's policies with regard to academic misconduct can be found at

http://www.purdue.edu/studentregulations/student_conduct/regulations.html

Any incidence of academic misconduct will be reported to the Office of the Dean of Students. Academic misconduct may result in disciplinary sanctions including expulsion, suspension, probated suspension, disciplinary probation, and/or educational sanctions. In addition, such misconduct will result in punitive grading such as:

- receiving a lower or failing grade on the assignment, or
- assessing a lower or failing grade for the course

Punitive grading decisions will be made after consultation with the Office of the Dean of Students. Please note reported incidences of academic misconduct go on record for reference by other instructors. Further, a record of academic misconduct is likely to influence how current/future situations are handled.

To provide you with an unambiguous definition of academic misconduct, the following text has been excerpted from "Academic Integrity: A Guide for Students", written by Stephen Akers, Ph.D., Executive Associate Dean of Students (1995, Revised 1999, 2003), and published by the Office of the Dean of Students in cooperation with Purdue Student Government, Schleman Hall of Student Services, Room 207, 475 Stadium Mall Drive West Lafayette, IN 47907-2050.

"Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, *Student Regulations*] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972]

More specifically, the following are a few examples of academic dishonesty that have been discovered at Purdue University.

- substituting for another student on an exam
- substituting in a course for another student
- paying someone else to write a paper and submitting it as one's own work
- giving or receiving answers by use of signals during an exam
- copying with or without the other person's knowledge during an exam
- doing class assignments for someone else
- plagiarizing published material, class assignments, or lab reports
- turning in a paper that has been purchased from a commercial research firm or obtained from the internet
- padding items of a bibliography
- obtaining an unauthorized copy of a test in advance of its scheduled administration
- using unauthorized notes during an exam
- collaborating with other students on assignments when it is not allowed
- obtaining a test from the exam site, completing and submitting it later
- altering answers on a scored test and submitting it for a regrade
- accessing and altering grade records

- stealing class assignments from other students and submitting them as one's own
- fabricating data
- destroying or stealing the work of other students

Plagiarism is a form of academic dishonesty where one person presents another's ideas or words as their own. This is most likely to occur in the following ways:

- using the exact language of someone else without the use of quotation marks and without giving proper credit to the author
- presenting the sequence of ideas or arranging the material of someone else, even though such is expressed in one's own words, without giving appropriate acknowledgment
- submitting a document written by someone else but representing it as one's own"

LAB REPORTS SHOULD NOT BE PLAGIARIZED. IT IS STRESSED THAT EACH STUDENT IS EXPECTED TO PRODUCE AN INDEPENDENT, ORIGINAL LAB REPORT! TURNITIN WILL BE USED TO EXAMINE ALL LAB REPORTS FOR PLAGIARISM

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern. More details are available on our course Brightspace under University Policies.

NOTICE OF COPYRIGHT PROTECTION OF COURSE MATERIALS

Effective learning environments provide opportunities for students to reflect, explore new ideas, post opinions openly, and have the freedom to change those opinions over time. Students and instructors are the authors of the works they create in the learning environment. As authors, they own the copyright in their works subject only to the university's right to use those works for educational purposes (Visit [Purdue University Copyright Office](#)). Students may not copy, reproduce or post to any other outlet (e.g., YouTube, Facebook, or other open media sources or websites) any work in which they are not the sole or joint author or have not obtained the permission of the author(s).

The policy on copyrighted materials is available on the course **Brightspace** page under "University Policies" and "Use of Copyrighted Materials."

Among the materials that may be protected by copyright law are the lectures, notes, and other material presented in class or as part of the course. Always assume the materials presented by an instructor are protected by copyright unless the instructor has stated otherwise. Students enrolled in, and authorized visitors to, Purdue University courses are permitted to take notes, which they may use for individual/group study or for other non-commercial purposes reasonably arising from enrollment in the course or the University generally.

Notes taken in class are, however, generally considered to be "derivative works" of the instructor's presentations and materials, and they are thus subject to the instructor's copyright in such presentations and materials. No individual is permitted to sell or otherwise barter notes, either to other students or to any commercial concern, for a course without the express written permission of the course instructor. To obtain permission to sell or barter notes, the individual wishing to sell or barter the notes must be registered in the course or must be an approved visitor to the class. Course instructors may grant or withhold such permission at their discretion and may require a review of the notes before they are sold or bartered. If they do grant such permission, they may revoke it at any time, if they so choose.

EMERGENCY PREPAREDNESS

In the event of a major campus emergency, course requirements, deadlines, and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted on the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to check your @purdue.edu email regularly. The entire policy is available in the "Emergency Preparedness" Statement on Brightspace.

ON-LINE COURSE EVALUATIONS

During the last two weeks of the semester, you will be provided an opportunity to evaluate this course and your instructor(s). To this end, Purdue has transitioned to online course evaluations. You will receive an official email from evaluation administrators with a link to the online evaluation site. You will have two weeks to complete this evaluation. Your participation in this evaluation is integral to this course. Your feedback is vital to improving education at Purdue University. I strongly urge you to participate in the evaluation system.

MENTAL HEALTH

If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try [WellTrack](#). Sign in to access information and tools at your fingertips, available 24/7.

If you need support and information about options and resources, please contact or see the [Office of the Dean of Students](#). Call 765-494-1747. Hours of operation are M-F, 8 am- 5 pm.

If you find yourself struggling to find a healthy balance between academics, social life, stress, etc., sign up for free one-on-one virtual or in-person sessions with a [Purdue Wellness Coach at RecWell](#). Student coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign-up is completely free and can be done on BoilerConnect. If you have any questions, please contact Purdue Wellness at evans240@purdue.edu.

If you're struggling and need mental health services, Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact [Counseling and Psychological Services \(CAPS\)](#) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS office on the second floor of the Purdue University Student Health Center (PUSH) during business hours.

BASIC NEEDS SECURITY

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support. No appointment is required, and Student Support Services is available to serve students from 8 a.m.-5 p.m., Monday through Friday. Considering the significant disruptions caused by the current global crisis, as it relates to COVID-19, students may submit requests for emergency assistance from the [Critical Needs Fund](#)

ACCESSIBILITY AND ACCOMODATIONS

Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247.

DISCLAIMER

This syllabus is subject to change. You will be notified of any changes as far in advance as possible via an announcement on Brightspace. Monitor your Purdue email daily for updates.

PROJECT FOR HONORS COLLEGE STUDENTS

Create a presentation for the Biochemistry Club Outreach Program: Use the BCHM 221 course to create an illustrative presentation on how analytical quantification of biomolecules is used to diagnose a metabolic disorder. Please prepare a poster, a PowerPoint presentation, or a multimedia approach.

PROJECT DUE DATE

December 4

CREDIT

20 points are awarded for this honors project.

Lab/Lecture	Topic
Lecture / Basic Lab	Course Introduction / Lab Safety and Accuracy v/s Precision/Acid-Base Chemistry and Buffers/pH Meters
No Recitation / Basic Lab	Determination of pK_a values by pH titration, observation of a carbanion in solution
MLK week	
Lecture/ Forensic lab	Acid-Base Chemistry and Buffers
Recitation for PS#1 / Forensic Lab	Acid-Base Chemistry and Buffers
Lecture /Basic Lab	enzyme-linked immunosorbent assay (ELISA) and absorbance detection by Spectroscopy: Hormones
No Recitation/Basic Lab PS#1 due	Spectroscopy/absorbance. Forensic case - Hormones
Lecture/ Forensic lab	Spectroscopy/absorbance. Forensic case - Hormones
Recitation for PS#2 / Forensic Lab	Spectroscopy/absorbance. Forensic case - Hormones
Lecture / Basic Lab	Coupled enzyme assay with luminescence detection: Carbohydrates (glucose/insulin signaling)
No Recitation / Basic Lab	Coupled enzyme assay with luminescence detection
Lecture/ Forensic Lab	Coupled enzyme assay with luminescence detection
Recitation for PS#3 / Forensic Lab	Coupled enzyme assay with luminescence detection
Lecture / Basic Lab	Thin Layer Chromatography with fluorescence detection of plant pigments
No Recitation / Basic Lab PS#3 DUE	Thin Layer Chromatography with fluorescence detection of plant pigments
Lecture/ Forensic Lab	Thin Layer Chromatography with fluorescence detection of plant pigments
Recitation for PS#4 / Forensic Lab	Thin Layer Chromatography with fluorescence detection of plant pigments
Spring Break	
Lecture / Basic Lab	HPLC Analysis of Aromatic Amino Acids
No Recitation / Basic Lab PS#4 DUE	HPLC Analysis of Aromatic Amino Acids

Lecture/ Forensic Lab	HPLC Analysis of Aromatic Amino Acids
Recitation for PS#5 / Forensic Lab	HPLC Analysis of Aromatic Amino Acids
Lecture / Basic Lab	Gas Chromatography of fatty acids
MIDTERM EXAM Basic Lab	GC
Lecture / Forensic Lab	GC
No Recitation / Forensic Lab PS#5 DUE	GC
Lecture / Basic Lab	Mass Spectrometry of nucleosides
No Recitation / Basic Lab	MS
Lecture/help session No Lab	
FINAL EXAM	