



DEPARTMENT OF BIOCHEMISTRY

BCHM 22100 – Analytical Biochemistry

3.00 Credit Hours

Fall 2021

COURSE INFORMATION

- **Course number and title:** BCHM 22100-Small Molecule Biochemistry
- **CRN: 24023 (Lecture section 004), 11890 (Lab section 002), 14756 (Lab section 003)**
- **Meeting times:**
Lecture: Monday 11:30-12:20 PM, LILY 3410
Laboratory: Section 2: Wednesday 11:30 AM-2:20 PM, BCHM 112
Section 3: Friday 11:30 PM-2:20 PM, BCHM 112
- **Instructional modality: Face-to-Face**
- **Course Credit hours: 3.00**
- **Course Brightspace page(lecture):** <https://purdue.brightspace.com/d2l/home/331273>

INSTRUCTOR: **Prof. Frederick Gimble**
Office: BCHM 10
TEL: 494-1653
e-mail: fgimble@purdue.edu

TEACHING ASSTS: **Mr. Kedric Milholland**
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e-mail: kmilholl@purdue.edu

Mr. Andrew DeMarco
Office: BCHM 214
e-mail: demarco0@purdue.edu

Office hours: Professor Gimble offers office hours by appointment and can be arranged to be online or inperson. Mr. Milholland and Mr. DeMarco will hold office hours each week at a time to be determined and announced on Brightspace.

COURSE DESCRIPTION

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

The primary objectives of this course are to introduce students to small biological molecules that have biological functions on their own or are precursors to large macromolecules. The structure and function of the small molecules will be demonstrated through the observation of their separatory properties and chemical reactivities. Principles and theory of techniques will be presented during lecture periods followed by application of the techniques during lab periods. Methods include chemical fractionation, thin layer chromatography, scanning spectrophotometry, and ELISA assays. Basic lab skills and concepts will be reinforced and use of the scientific method will be incorporated

into the lab experiments. Students will learn proper scientific communication skills by writing lab reports.

LEARNING OUTCOMES

BCHM 22100 students will understand the molecular principles of life based on the core disciplines of biology, chemistry and physics.

BCHM 22100 students will be skilled laboratory scientists. They will perform a wide variety of biochemical and molecular techniques.

BCHM 22100 students will demonstrate knowledge of the scientific method. They will understand the concepts and importance of hypotheses, experimental design to test hypotheses, and data analysis in the creation of new knowledge.

BCHM 22100 students will acquire information literacy: the ability to locate, evaluate, and utilize information in the disciplines of biochemistry and molecular biology that is required for research, data analysis, and communication.

BCHM 22100 students will communicate scientific knowledge, experiments and conclusions effectively as writers.

BCHM 22100 students will appreciate the contributions of our discipline to society, including improvements to medicine, agriculture, the economy and the environment.

LEARNING RESOURCES, TECHNOLOGY AND TEXTS

There is no required textbook for the course.

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

In some cases you will be directed to websites or provided with additional reading material for information relevant to the labs. Some of the extra reading material may also be posted on the course Brightspace page.

A useful website for some of the material is available from the Chemistry Department at Michigan State University:
<http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/biomol.htm>

BRIGHTSPACE

The course syllabus, lecture notes, lab instructions, Boilercast recorded lectures and other materials will be available via the Purdue University Brightspace site:
<https://purdue.brightspace.com>.

ASSIGNMENTS

Your learning will be assessed through a combination of 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 during the semester on Brightspace according to the schedule. Problem sets will be due one week following distribution, and will NOT be accepted after the deadline. Each lab report will count 6 points towards the final grade. Completing these problems will provide students with practice in completing laboratory calculations and with opportunities to think critically about experimental design. The problem sets must be completed independently.

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 that describe the laboratory exercise and the collected results will be submitted using Brightspace. Each lab report will count 30 points towards the final grade. Lab reports will be scored using an established rubric that is available to students on Brightspace. Students will be working in teams to collect their data but they will **independently** write their own lab reports. Students will have the opportunity to use Turnitin on Brightspace to view their laboratory reports prior to final submission to ensure that their submitted reports are **original**. If the instructor concludes that a laboratory report was plagiarized, a score of zero will be assigned for that report. If two reports exhibit plagiarism, a failing grade will be assigned for the semester. Lab reports will be submitted using Brightspace and are due by the beginning of the subsequent lab session. Lab reports can be submitted within a 24 hour "late" window after the deadline, and will automatically be penalized 25% of the total score before grading. Failure to turn in a lab report after this time will result in a grade of 0 being recorded.

All lab reports are expected to include the following:

1. Title page/Overall organization - title of lab exercise, your name and your lab partner's name.
2. Introduction - Briefly describe the experiment performed and the purpose for the experiment. Include a statement of hypothesis describing what you expect to observe. This section should be no more than 1 page, double-spaced.
3. Materials and Methods - Describe the procedures used to conduct the experiment in sufficient detail so someone with the appropriate knowledge and skill could use your report to repeat the experiment. There is no length restriction for this section – use as much space as needed.
4. Results – Present, in an organized manner, the data requested in the lab handout. Be sure you show all your data and any calculations you have made to interpret the data. This is essential for obtaining partial credit. Include in this section any graphs, photos, and tables as appropriate. Be sure to include legends with the figures, explaining the content of the figure. There is no length restriction for this section – use as much space as needed.
5. Discussion – provide a concise discussion of the results you obtained in the lab experiment. Specifically, address whether or not your data support your hypothesis. Speculate why any unexpected results might have been observed and suggest explanations for why any experiments didn't work as expected. Give your interpretations as to the quality of the data obtained and what you learned/discovered from the experiment. All questions listed in the lab handout should be answered here. This section should be no more than 1 page, double-spaced

There is no required lab notebook for this course. You are free to keep notes and data from the lab experiments in any form you like.

Exams:

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

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

returned.

GRADING SCALE

Assessment	Due	Total Points	% of grade
Quizzes	Each lab	30	5%
Problem sets	Various	30	5%
Midterm Exam	Oct. 13/16	90	15%
Final Exam	Dec. 6	90	15%
Lab Reports	Weekly	360	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.”

EXTRA CREDIT

There will be no opportunity for extra credit.

OBTAINING EXTRA HELP

Professor Gimble will be available to answer your questions in person or online (arrange to meet by e-mail) or you can submit questions by email. Mr. DeMarco and Mr. Millholland will offer office hours that will be announced on Brightspace.

CLASS ATTENDANCE

Students are expected to be present for every laboratory session. Attendance will be taken at the beginning of each class and lateness will be noted. Unexcused absences from a laboratory session will result in a zero grade 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 word 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, and parenting leave. For details, see the [Academic Regulations & Student Conduct section](#) of the University Catalog website. Guidance on class attendance related to COVID-19 are outlined in the [Protect Purdue Pledge for Fall 2021](#) on the Protect Purdue website.

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 your adviser and notify me via email or Brightspace. We will make arrangements based on your particular situation. Please note that, according to [Details for Students on Normal Operations for Fall 2021](#) announced on the Protect Purdue website, "individuals who test positive for COVID-19 are not guaranteed remote access to all course activities, materials, and assignments."

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 which have been discovered at Purdue University.

- substituting on an exam for another student
- 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 special kind of academic dishonesty in which one person steals another person's ideas or words and falsely presents them as the plagiarist's own product. 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"

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.

Purdue's Honor Pledge was developed by students to advance a supportive environment that promotes academic integrity and excellence. It is intended that this pledge inspires Boilermakers of all generations to stay "on track" to themselves and their University. "As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue."

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

Determination of academic misconduct by the instructor will result of forwarding of that information to the Dean of Students office. At the least, a grade of zero will be given for the assignment or exam.

NOTICE OF COPYRIGHT PROTECTION OF COURSE 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 choose to grant or not grant such permission at their own discretion, and may require a review of the notes prior to their being 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 onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your @purdue.edu email on a frequent basis.

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. On Monday of the fifteenth week of classes, 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 an integral part of this course. Your feedback is vital to improving education at Purdue University. I strongly urge you to participate in the evaluation system.

NON-DISCRIMINATION POLICY

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. A hyperlink to Purdue's full Nondiscrimination Policy Statement is included in our course Brightspace under University Policies.

MENTAL HEALTH

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

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. There is no appointment needed and Student Support Services is available to serve students 8 a.m.-5 p.m. Monday through Friday. Considering the significant disruptions caused by the current global crisis as it related to COVID-19, students may submit requests for emergency assistance from the [Critical Needs Fund](#)

ACCESSIBILITY AND ACCOMODATIONS

Purdue University is committed to making learning experiences accessible. 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.

Date	Lab/Lecture	Topic
Aug. 23	Lecture	Course introduction
Aug. 25/27	Lab 0	Lab Safety, How biochemists measure volumes and weights, proper use of pipettors
Aug. 30	Lecture PS#1 due	Absorbance of light by biological compounds/Spectrophotometers
Sept. 1/3	Lab 1	Optical Absorbance and Quantitation of Light Absorbing Molecules
Sept. 6	No Class Lecture available online	Acid-Base chemistry and buffers/pH meters
Sept. 8/10	Lab 2	Determination of pK _a values by pH titration, observation of a carbanion in solution
Sept. 13	Lecture	Carbohydrates/Carbohydrate assays
Sept. 15/17	Lab 3	Qualitative chemical tests for reducing sugars, pentoses and ketoses/Determination of sugars in hydrolysates of several plant materials
Sept. 20	Lecture PS#2 due	Lipids/Principles of Chromatography
Sept. 22/24	Lab 4	Purification of egg yolk lipids by organic extraction and partition column chromatography/Quantitation of phospholipids, triacylglycerols and cholesterol using TLC
Sept. 27	Lecture	Principles of assays/ Lipid assays
Sept. 29/Oct.1	Lab 5	Chemical analysis of purified lipids to determine esters (fatty acids), phosphate (phospholipids) and cholesterol
Oct. 4	Lecture	Lipids and health
Oct. 6/8	Lab 6 PS#3 due	Lipid chemistry in naturally occurring fats
Oct. 11	NO CLASS Fall Break	
Oct. 13/15	EXAM	
Oct. 18	Lecture	Plant pigments
Oct. 20/22	Lab 7	Extraction and purification of plant pigments
Oct. 25	Lecture	Amino acid properties/Ion exchange chromatography
Oct. 27/29	Lab 8	Ion exchange chromatography of amino acids
Nov. 1	Lecture PS#4 due	Assays for amino acids
Nov. 3/5	Lab 9	Analysis of amino acids by chemical reactivity and TLC
Nov. 8	Lecture	Introduction to Antibodies and ELISA
Nov. 10/12	Lab 10	Quantitation of a steroid hormone by ELISA
Nov. 15	Lecture	Introduction to nucleotides/ATP assay
Nov. 17/19	Lab 11	Quantitation of intracellular ATP by luminescence

Nov. 22	NO CLASS	
Nov. 24	NO CLASS	
Nov. 26	NO CLASS	
Nov. 29	Lecture PS#5 due	Recombinant DNA methods/Alkaline lysis plasmid prep
Dec. 1/3	Lab 12	Purification of plasmid DNA
Dec. 6	EXAM	