

**BIOCHEMISTRY AND MOLECULAR BIOLOGY (BMB) 212**  
**Fall 2018, August 21 – December 7, 2018**  
**Classes are conducted in room 157 North Frear**

Week	Dates	Experiments	Submission due
1	Aug 21, 23	BMB212 course introduction and meet up <b>(MANDATORY)</b>	
2	Aug 28, 30	Expt. 1 Aqueous solution	-Written procedure Expt. 1 -Pre-lab quiz
3	Sep 4, 6	Expt. 2 Spectroscopy	-Written procedure Expt. 2 -Pre-lab quiz -Lab submission Expt. 1
4	Sep 11, 13	Expt. 3 Proteins (purification; procedure 1, steps 1-4b)	-Written procedure Expt. 3 procedure 1, steps 1-4b -Pre-lab quiz
5	Sep 18-20	Expt. 3 Proteins (Purification; Procedure 1, steps 4c-7)	-Written procedure Expt. 3 Procedure 1, steps 4c-7 -Pre-lab quiz -Lab submission Expt. 2
6	Sep 25, 27	Expt. 3 Proteins (Purification: Procedure 1, step 8 & Procedure 2)	-Written procedure Expt. 3 Procedure 1, step 8 & Procedure 2 -Pre-lab quiz
7	Oct 2, 4	Expt. 3 Proteins (Concentration Analysis; Procedure 3)	-Written procedure Expt. 3 Procedure 3 -Pre-lab quiz -Have Table II (p. 36) complete
8	Oct 9, 11	Expt. 4 Enzyme Kinetics (Procedures 1 & 2)	-Written procedure Expt. 4 Procedures 1 & 2 -Pre-lab quiz -Lab submission Expt. 3
9	Oct 16, 18	Expt. 5 Carbohydrates (TLC)	-Written procedure Expt. 5 -Pre-lab quiz -Lab submission Expt. 4
10	Oct 23, 25	Expt. 6 DNA (Plasmid Isolation)	-Written procedure Expt. 6 Procedure 1 -Pre-lab quiz -Lab submission Expt. 5
11	Oct 30, Nov 1	Expt. 6 DNA (Restriction Enzyme Digests)	-Written procedure Expt. 6 Procedures 2 & 3 -Pre-lab quiz
12	Nov 6, 8	Expt. 7 Lipids (Procedures 1 & 2)	-Written procedure Expt. 7 Procedures 1 & 2 -Pre-lab quiz
13	Nov 13, 15	Expt. 7 Lipids (Procedures 3 & 4)	-Written procedure Expt. 7 Procedures 3 & 4 -Pre-lab quiz -Lab submission Expt. 6
Nov 19-23 Thanksgiving – NO CLASSES			
14	Nov 27, 29	TEST: Expts. 1 - 7 (Duration 90 minutes)	-Lab submission Expt. 7

You must provide your own laboratory **Safety Goggles** for each lab period.

## Course Objectives

BMB 212 is designed to introduce Biochemistry and Molecular Biology principles and routine lab techniques to a general science audience. Specifically, student goals are to learn about protein isolation, enzyme kinetics, carbohydrate, and lipid biochemistry and molecular cloning.

## Specific Goals

- determine a weak acid's buffer range with a pH meter
- quantify riboflavin concentrations using a Spectronic 200 spectrophotometer
- partially purify acid phosphatase from wheat germ using ammonium sulfate precipitation, centrifugation and dialysis
- study acid phosphatase kinetics
- hydrolyze glycogen with HCl and salivary amylase
- identify hydrolytic products using thin layer chromatography
- isolate plasmid DNA from E. coli
- digest plasmid DNA with restriction enzymes and analyze the products using agarose gel electrophoresis
- make soap from commercial oils and fats
- identify fatty acid methyl esters using gas chromatograph

## Learning Outcomes

After the fifteen weeks in BMB 212, you will have:

- obtained a working knowledge of techniques typically used to study biomolecules
- gained hands-on experience with the techniques typically used to study biomolecules
- acquired laboratory competence and confidence
- proved the close relationship between theory and reality
- cultivated problem solving and improved data interpretation skills
- developed hypothesis design, implementation, and evaluation skills
- improved oral and written communication skills
- developed an awareness to the importance of details (i.e. small things can make a big difference)
- gained an appreciation of the relevancy of biochemistry in your life

## Prerequisites

Students are expected to have successfully completed Chem 110 and either Chem 202 or Chem 210. In addition, you are to have either taken or are currently enrolled in BMB 211. It is highly recommended that you have already taken a year of a general chemistry laboratory course. Being able to handle dilutions and mathematic equations is helpful.

## Attendance

All students are required to attend and actively participate in each laboratory session. Excused absences may be made up during another laboratory session that **same week**. Make up tests may be in essay or oral form at the discretion of the instructor. **You must contact both your TA and the instructor prior to class time if your absence is to be excused.** You may also leave a message with the Department of Biochemistry and Molecular Biology Office (865-5497). If prior approval was not obtained and lab was missed, documentation explaining the circumstances of your absence is required. For each lab missed without a legitimate excuse and/or documentation, you will receive 0 value for any tests administered that day plus your final grade will be lowered by a letter grade.

## Grading

### Pre-lab activities:

Written procedures <sup>1</sup>	15 points each (12)
Pre-lab quiz <sup>2</sup>	15 points each (12)

### Lab Reports:

Expt. 1	50 points
Expt. 2	50 points
Expt. 3	50 points
Expt. 4	50 points
Expt. 5	50 points
Expt. 6	50 points
Expt. 7	50 points

**Test:** 250 points each

**TA Evaluation Points:**  $\frac{40 \text{ points (3 for each lab, 13 in total)}}{1000 \text{ possible points}^3}$

<sup>1</sup>You need to show your TA the written lab procedures in order to gain permission to conduct experiments. Lacking the written lab procedures is an indication of poor preparation, TAs and instructor might ask you to leave or schedule a make-up lab for the safety of yours and your lab mates. See next page for details. See Page 80 for an example.

<sup>2</sup>Pre-lab quiz will be available 48 hours (2 days) prior to your designated lab slot on Canvas. To obtain the credits, you should complete the pre-lab quiz online. Pre-lab quiz consists of up to 5 questions in the format of multiple choice question, short answer question, and/or calculation question.

<sup>3</sup>Final grades will be determined statistically, considering each section individually.

## LABORATORY SUBMISSION GUIDELINES

### Items done before the lab:

- Written lab procedure
- Pre-lab quiz

Lab reports are due at the beginning of the lab period the week that they are due (See schedule). The grade of those received after the due date will be reduced by 5% of their total value per day of late submission up to a maximum of 25%.

NO formal lab reports are required for the BMB212 2018 Fall semester. Instead, you should submit the following:

- **Title page:** include your name, your partner's name, the experiment title, the due date, and the date submitted.
- **Written procedures:** after reading the lab manual, you should use your own words to reproduce a written lab procedure that is concise and accurate enough to guide anyone with basic background to conduct the planned experiments. This should NOT be an exact copy of your lab manual. **You need to show this to your TA at the beginning of the lab in order to gain permission to conduct the experiments.**
- **Results** (data and calculations): include all the data as it was originally collected during the lab session in your lab manual (this is your raw data). Many experiments also require the student to present the data graphically. All graphs should have
  - a title that describes the purpose of or finding obtained from the graph
  - (\_\_\_\_\_ vs \_\_\_\_\_ is not an acceptable title)
  - both x- and y-axis identified along with the appropriate units
  - all documented data points
  - a smooth curve fit to the data points, no connecting of the dots
  - dashed lines indicating where sample values were obtained (most appropriate for standard curve graphs)
  - If calculations are necessary to arrive at some result, a sample calculation illustrating the equation and all steps must be provided. Subsequent results derived from the same type of calculation may simply be listed.
- **Questions:** Following every lab, there are pertinent questions students are expected to answer and attach to the final submission.
- **Bibliography:** when necessary, please include proper references using the format shown below:
  - William R. Harvey, Signe Nedergaard, Sodium-independent active transport of potassium in the isolated midgut of the Cecropia silkworm. *Proc. Natl. Acad. Sci. U.S.A.* **51**, 731-735 (1964).
  - M. Lister, *Fundamentals of Operating Systems* (Springer-Verlag, New York, ed. 3, 1984), pp. 7-11. [third edition]

Laboratory submission must be **computer generated** and include the aforementioned sections. A bibliography should be included if references are used.

When preparing the report, remember that neatness and readability (and therefore, comprehensibility) is of the utmost importance to your audience, i.e., your teaching assistant. Points will be deducted for reports prepared hastily and with inappropriate materials (e.g., on paper torn from spiral notebooks, illegibly written graphs on widely ruled tablet paper instead of finely ruled scientific/engineering paper, etc.).

Students will work in pairs for purposes of data collection: however, each student will prepare a separate submission – **an individual submission, NO joint submission.** You may discuss your results with other members of the class but you must write your report independently, i.e. your own graphs, text, style, layout, etc. Lab submission with the same style, graphs, fonts, text, placement, and sentence “meaning” order will be considered a joint lab submission and will have at least 30% of the lab report evaluation deducted.

### Help session:

If you have questions and issues about the lab or lab report report, please contact your designated teaching assistant or attend their office hours. If the questions or issues cannot be resolved, please bring to my attention by email or in person.

### **Academic Dishonesty Statement:**

Academic dishonesty is not limited to simply cheating on an exam or assignment. The following is quoted directly from the "PSU Faculty Senate Policies for Students" regarding academic integrity and academic dishonesty: "Academic integrity is the pursuit of scholarly activity free from fraud and deception and is an educational objective of this institution. Academic dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating of information or citations, facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students." All University and Eberly College of Science policies regarding academic integrity/academic dishonesty apply to this course and the students enrolled in this course. Refer to the following URL for further details on the academic integrity policies of the Eberly College of Science: <http://www.science.psu.edu/academic/Integrity/index.html>. Each student in this course is expected to work entirely on her/his own while taking any exam, to complete assignments on her/his own effort without the assistance of others unless directed otherwise by the instructor, and to abide by University and Eberly College of Science policies about academic integrity and academic dishonesty. Academic dishonesty can result in assignment of "F" by the course instructors or "XF" by Judicial Affairs as the final grade for the student.

The Eberly College of Science Code of Mutual Respect and Cooperation ([www.science.psu.edu/climate/Code-of-Mutual-Respect\\_final.pdf](http://www.science.psu.edu/climate/Code-of-Mutual-Respect_final.pdf)) embodies the values that we hope our faculty, staff, and students possess and will endorse to make The Eberly College of Science a place where every individual feels respected and valued, as well as challenged and rewarded.

### **Disabilities Statement:**

Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for reasonable academic adjustments in this course, contact the Office for Disability Services (ODS) at [814-863-1807](tel:814-863-1807) (V/TTY). For further information regarding ODS, please visit the Office for Disability Services Web site at <http://equity.psu.edu/ods/>.

In order to receive consideration for course accommodations, you must contact ODS and provide documentation (see the documentation guidelines at <http://equity.psu.edu/ods/guidelines/documentation-guidelines>). If the documentation supports the need for academic adjustments, ODS will provide a letter identifying appropriate academic adjustments. Please share this letter and discuss the adjustments with your instructor as early in the course as possible. You must contact ODS and request academic adjustment letters at the beginning of each semester.

### **Resolution of Grading Conflicts:**

If you feel that there is a problem with your grade, talk to your TA first. If you cannot resolve the conflict, I am happy to discuss your concerns (see my contact on the first page). If you remain unsatisfied after this, you may contact: Dr. Meredith Defelice, Director of BMB Undergraduate Curricular Affairs; 153 North Frear Laboratory; Phone 867-3365.

### **Tests**

Scheduled test will be administered according to the syllabus (See schedule). These tests will include material from experiments 1 to 7. The format of the test is a combination of multiple-choice, short-answered, and calculation questions.

### **Teaching Assistant Evaluation Points**

An important part of your grade will be determined by the teaching assistant's evaluation of your general proficiency, organization, preparedness, and cooperation over the entire semester. Approximately 4 points per class period is designated for this evaluation. Some examples of behavior that will result in 2-4 points reductions are: unprepared for the day's exercise, overreliance on a lab partner for data collection, tardiness, failure to show

your data to your TA for approval before leaving, leaving lab equipment and supplies out of the desk at the end of the lab session, failure to clean glassware, carelessness or disregard of safety precautions, abuse of instrumentation, disrespectful to peers, TAs, and instructors etc.

## MISCELLANEOUS

### Data Collection

Record data in ink on the data sheets provided in the laboratory manual. If a value is changed, cross out the original value with a single line, leaving it legible. Write the corrected value above or below.

Example:   ~~0.35~~ ← keep this      Show your data to the instructor before leaving class.  
              0.40