BIOL/CHEM 328: Biochemistry II
Laboratory Syllabus

~ Spring Semester, 2015 ~

Note: A separate syllabus will be provided for the lecture portion of this course, so the details in this syllabus refer only to the lab component.

Instructor: Dr. Diane Husic
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Office: 311 Collier Hall of Science

Office hours:

Mondays	10:15 –	11:15 am
Wednesdays	10:15 –	11:15 am
	4:30 –	5:30 pm
Thursdays	10:15 –	11:15 am

** I can meet with you at other times, but please schedule these appointments with me ahead of time.*

Class Times:

Lecture:	MWF 8:55 – 10:05 am in 210 Collier
Lab:	Monday @ 1:15 - 4:15 pm in 301 Collier HOS
	OR
	Thursday @ 12:45 – 3:45 pm in 301 Collier HOS

Course Prerequisites: BIOL/CHEM 327 (Biochemistry I); and therefore also CHEM 212 *OR* permission of instructor

Course text: There is no separate text for laboratory. Information regarding specific laboratory exercises will be provided either as handouts or as documents posted on the BlackBoard site for the course.

The lecture text (Lehninger Principles of Biochemistry, 5th ed.) may serve as a resource for some of the laboratory exercises.

Required supplies: A laboratory notebook is required and should have numbered pages and grids (for graphing). Please leave space for a table of contents in the front. We can discuss the possibility of an electronic notebook.

Safety goggles - Please bring these to lab each week.

Course objectives/introductory comments:

The points listed below provide both a description of the goals of the laboratory portion of this course and a sense of my expectations.

- You will conduct experiments and complete exercises that will continue to expose you to techniques and laboratory principles used for studies of biological molecules and processes. Besides relating to principles discussed in class and in the text, we will delve into other areas important to the field such as bioinformatics, the use of genomic databases and understanding biochemical primary literature. It is important to recognize that *in silico* approaches are critical for much of what biochemists now do. Physical biochemistry and analytical biochemistry approaches will also be explored.

- I emphasize experimental design, methodology, the further development of good laboratory practices (including safety), and data analysis. Acquisition of reliable and meaningful data is important; however, if the experiment does not go as planned, it is also important for you to determine whether there were flaws in experimental design, technical problems, or "operator error"! Troubleshooting is an important component of scientific research in both academia and industry.

- For each new experiment (or other lab exercise), I intend to distribute materials (typically via BlackBoard) ahead of time that introduce the experimental theory and procedures. **It is expected that you read this material before the start of the laboratory period.** You should outline the experimental procedure in your own words in your laboratory notebook and list the equipment and supplies that you will need for the experiment. Experiments run smoother and quicker if you are organized and prepared before coming to lab.

- Given the importance of good record keeping and communications skills in any science-related job, you will be expected to maintain thorough and accurate records in laboratory notebooks, and write concise, detailed reports using scientific journal article format for at least some of our lab exercises. You may also be asked to orally defend your data and explain the significance of your results. Thus, a good understanding of the biochemical concepts *and* effective oral and written communication skills are expected of all students enrolled in this course.

- In general, experiments are more complex than lower level courses and several of the experiments will be investigative or "research-oriented". In some cases, you will be designing your own procedures utilizing primary literature resources to guide you. Some of the experiments have not been done before -- so we can only predict the results. (In other words, we may not know what the "right answer is".) This will not be a cookbook lab course; rather, the course is designed to give you a better idea of what a scientist actually does.

- Sometimes, we will spend time having a "lab meeting" or "journal club" since that is also an important part of what "doing science" involves when you are a part of a research team.

- My expectations for each of you are high. You will need to work hard, think hard, and be independent and self-confident with your ideas and lab technique. I will, of course, be available to help you along the way. I will introduce the new techniques and methodologies as needed.

- Attendance is crucial for the laboratory sessions, and due to the complex nature of many of the experiments, make-ups are not possible.

- There will be times when portions of an experiment can not be completed during the regularly scheduled times; research is not done in neat little 3-hour blocks. Coming to lab prepared helps you to make efficient use of your time, but there may be times when you have to come in to lab outside of the scheduled lab time to work on some aspect of the experiment. Collaborative team-work (division of labor) typically works well in this course.

- Participation and cooperation by each student is essential to complete the experiments on time. If working in a group, members must be able to work together and communicate with each other. You may meet with others in the group or with other class members to discuss the experiment and interpret the results, but your assignments and lab reports must be individually prepared. It is your responsibility to obtain all of the necessary data and enter it into your notebook before leaving the lab for the day.

- At the end of each lab, I expect students to clean up the benches, the hoods, instrument areas, etc. This has been a problem in the past, but clean, organized lab spaces are part of good laboratory technique.

Of key importance in the lab:

1. Safety
2. A thorough understanding of the principles underlying the experiments
3. Coming to lab prepared
4. Attendance and participation
5. Asking questions
6. Good laboratory technique, including leaving the lab clean and organized

Special Accommodations: Students who wish to request accommodations in this class for a disability must contact Ms. Elaine Mara, Assistant Director of Academic and Disability Support, located on the first level of Monocacy Hall, or by calling 610-861-1401. Accommodations cannot be provided until authorization is received from the Academic Support Center.

Grading and evaluation for the laboratory portion of BIOL/CHEM 328:

The laboratory portion of the course will count as 25% of your total course grade. This grade will be determined as follows:

	% Total Laboratory Grade
Laboratory exercises	70
- Experimental design	
- Lab reports[1] and other forms of data presentation	
- Participation in lab discussions	
- Miscellaneous assignments	
- Laboratory final	
Laboratory technique, including participation and contributions to lab team, laboratory notebook[2]	30
	100%

[1]Regarding lab reports: Lab reports should be written as though there were to be submitted for publication (i.e. clear, concise, factual, and complete). It is useful to browse through biochemical journals to see appropriate formats for scientific reports, tables, figures, legends, references, etc. Reports will not be done for all experiments; sometimes we will have "lab meetings" to discuss results and our conclusions or there will be exercises designed to reinforce key points from the lab. Specific details will be given with each experiment. More details about format are provided below.

[2]Regarding lab notebooks: You are expected to keep a detailed laboratory notebook throughout the semester. Everything should go into your notebook: references, notes and plans for experiments, calculations, summaries, and, of course, all data. All entries are to be in **ink** (no white-out, erasures, etc.) and notebook pages are bound so that pages can't be ripped out or added. Do not write data on loose scraps of paper with the intention of entering the information into your notebook later. It is too easy to loose critical information this way. We will discuss the option of electronic notebooks. In this case, computers or iPads must be with you in lab and data entered directly.

ALTERATION OF EXPERIMENTAL DATA WILL ABSOLUTELY NOT BE TOLERATED. The elimination of any data from a table or graph must be noted and fully justified (typically by statistical means). The discussion of the data and the explanation of data which does not correlated with the expected results are more important than having the "right answer".

Highly recommended suggestions for notebook/laboratory record keeping:

-- Include a table of contents;
-- Number pages and date all entries;
-- Use one side of notebook for calculations, scribbling, etc. and use other side for entries (makes it easier to find things);
-- You should prepare for each lab ahead of time; include an objective, procedural outline or flow chart and relevant references in notebook prior to coming to lab. You can often set up data tables in your notebook ahead of time as well.

Laboratory report format:

A written formal laboratory report for an experiment will be due on an assigned date, typically one week following the completion of an experiment. **LATE LAB REPORTS WILL NOT BE ACCEPTED.**

All reports must be typed using proper grammar, complete sentences and paragraphs. Tables and graphs must be in ink also. Do not use pages from your laboratory notebook for your reports. Reports will be evaluated for their accuracy, completeness, format and quality (including neatness and professional looking graphs and tables). Reports that are written incorrectly or that are incomplete will be returned ungraded. In these cases, you may have the opportunity to redo the report after discussing the problems with me.

Manuscripts in biochemical journals (not review articles) provide examples of format and content. I highly suggest that you browse through some journals in the library to see what scientific reports are like. Specific guidelines will be given for individual reports, but a general format for your reports follows on the next page.

Do not wait until the last minute to write up a lab report. It is easier to start when the procedure and data are still fresh in your memory. That way, if you have questions, you will also have more time to ask me questions. For certain experiments, I will hold a help session to go through calculations, concepts, etc. prior to the due date for the report.

Specific guidelines will be given for individual reports, but a general format is presented below:

Title Page

- Include experimental title, date, lab section, and name(s) of experimenter(s).

Introduction

- The introduction should be a brief explanation of the experimental objectives and the general approach used to address the scientific question. Some theory underlying the experiment should also be included.

Methods

- The details of the methods should be described in complete sentences (not a list of tasks performed) only as they differ from the methods listed in the text, handout or other references used. The source of the complete procedure should be formally referenced in the bibliography at the end of the report.

- The methods section, as well as others, are written in the past tense (what was done). Also avoid "first person" usage ("I treated the samples with..."); rather, write using a passive voice ("The samples were treated with.....").

Results

Data:

- Tables and graphs of the raw data collected are included in the Results section of a report. Typically raw data is used to construct preliminary tables and graphs that would not be included in a formal publication, but I would like these included in your reports so that it is easier for me to find errors should they exist.

- Tables and figures should contain legends, should be neat and in ink, and should be titled, numbered, and clearly labeled (including units). Someone unfamiliar with the data and experiment should be able to remove a figure or table from a report and be able to determine the meaning and significance of the information within it without having to refer to the text of the report.

Calculations:

- Always include a sample calculation for all mathematical data manipulations so that I can check them for accuracy.

Text:

- Sometimes short explanations or descriptions of the data are included in the Results section, but detailed analyses or interpretation of the data is often found in the Discussion section of a research manuscript (or lab report).

Discussion

- This section is a summary and explanation of the results in terms of the principles to be learned. Relate the results back to the objective(s) stated in the Introduction. You should explain how the data demonstrates what was predicted or why the data deviates from the expected or literature values. "Experimental error" is not a specific enough explanation, but one that I commonly encounter when grading.

- Any questions asked in the lab handouts should be addressed in the Discussion section of the report by incorporating the answers into the text of the discussion.

References

- All reports should include a list of citations used for the methods, literature values, and theory or analysis included.

Laboratory rules and policies:

Below is a list of rules and procedures that we all must follow for safety, efficiency, good laboratory technique and courtesy to your lab mates.

General:

1. Safety glasses must be brought to each class and worn while in the lab when working with chemicals.

2. Bench space in the laboratory is for doing science. Do not put coats, backpacks, or other personal belongs on the benches or pieces of equipment.

3. No food or drink is permitted in the lab.

4. Be aware of the location of all safety equipment in the laboratory. Any chemical spill or personal injury, regardless of severity, must be immediately reported to the instructor.

5. Please be considerate and clean up your work areas completely at the end of the class. Return chemicals, glassware and equipment to their initial location. Do not disturb items in the laboratory that you are not using; remember that the lab space is used by others for classes and research. Remember that <u>30%</u> of your grade is related to lab technique of which neatness and clean-up are a part.

Glassware:

1. For the most part, you will be sharing glassware with students from other courses and who are doing research. Cleanliness is essential since glassware contaminants can destroy many biomolecules and interfere with experimental assays. Glassware that has contained protein solutions, organic chemicals or unknown solutions should be thoroughly washed with detergent and rinsed with excessive amounts of water. Detergents themselves will denature most enzymes, so it is essential that the glassware e well rinsed. Rinse glassware with distilled water after rinsing well with tap water. In the case of glassware that has only contained water-soluble salt or buffer solutions, just rinse well; it is not necessary to use detergent as this is often more difficult to rinse than the original solution. If using a detergent, use only the dilute detergent solutions which I provide.

2. Clean your own dirt glassware each lab period and return it to the appropriate place when you are finished using it.

3. Used pipettes should be placed <u>tip up</u> into the pipette holder immediately after use -- before materials can dry on the glass. Pipettes used for protein solutions, organic chemicals or caustic solvents should be rinsed with water first before placing them in this pipette holder. I will clean a batch of the pipettes when necessary. Please do not use any more pipettes than is necessary as the cleaning process is time consuming.

Chemicals, Storage, and Solution Preparation:

1. Some of the chemicals and stock solutions that you will need will be prepared for you ahead of time. Please be sure that you know what you are doing before you begin to use these solutions, and if you are in doubt, ask me. Most biochemicals are very expensive and I only prepare enough of the reagent to complete the experiment a single time.

2. Always store a reagent as recommended in the procedure or on the bottle. Chemicals that are stored in the refrigerator or freezer must be warmed to room temperature before opening the desiccator and/or bottle to avoid condensation which may accelerate the degradation of the chemical or hydrate it so that estimation of the amount of the reagent by weight measurement becomes impossible.

3. When you are responsible for preparing solutions, be sure to prepare all solutions with deionized water unless otherwise directed.

4. Label all solutions using labeling tape and markers provided. Include the contents, your initials, the class and the date when the solution was prepared.

5. If you will no longer need a solution, check with your lab partners and me before disposing of it. Some chemicals will require special disposal methods of which you will be informed.