



# **CHEM 4581**

## **Biochemistry Laboratory I**

### **Course Syllabus**

**Spring 2008**

January 6, 2008

**Mary E. Peek, Ph.D.**

Academic Professional – Biochemistry Laboratory Coordinator  
Georgia Institute of Technology  
School of Chemistry & Biochemistry  
Atlanta, GA 30032-0400

E-mail: [mary.peek@chemistry.gatech.edu](mailto:mary.peek@chemistry.gatech.edu)  
Office: Boggs Room 2-14  
Phone: 404-894-4001

### **COURSE OBJECTIVE**

The primary objective of this course is for students to (1) learn fundamental approaches for experimentally investigating biochemical problems, (2) learn the theoretical foundations for the methods used, and (3) understand the applicability of the biochemical methods to realistic situations. Topics covered in this course include methods for the isolation, purification, and characterization of proteins, nucleic acids and lipids; characterization of enzyme kinetics; and manipulation of macromolecular structures from databases using contemporary visualization software.

### **CLASS MEETINGS**

Lectures: Mondays, 4:05 - 4:55 pm      Boggs 2-28  
Laboratory Sections: TWRf, 1:05pm - 6:55 pm      Boggs 2-10

### **PREREQUISITES**

CHEM 3511 (Survey of Biochemistry) or 4511 (Biochemistry I)  
CHEM 3371 (Organic Chemistry Laboratory) or 3380 (Synthesis Laboratory II)

### **TEXT**

No official text is required, but *Biochemistry* by Voet and Voet is recommended as a supplement. Additional background reading material will be provided.

### **HONOR CODE**

All students are expected to follow the Georgia Tech Honor Code.

### **PLAGIARISM**

Using the words of another as one's own is known as plagiarism. Plagiarism is inappropriate in this laboratory and in all other situations. Material copied from laboratory handouts, textbooks, other students, or other sources must be contained within quotes, with the source cited. Students should minimize if not avoid the use of quotations in the text to their laboratory reports in an effort to develop mature technical writing skills. Occasionally experimental work in this laboratory will be done in teams or groups. However all data analysis and writing should be performed independently.

### **EQUIPMENT AND SUPPLIES REPLACEMENT**

In the event that glassware or other equipment and supplies are damaged or broken by students, the student must pay for the replacement of those items with your Buzz card. A list of commonly damaged items will be posted in the laboratory. Please exercise caution when working with electronic pipetting devices and electrophoresis equipment, among other delicate items in the Biochemistry Laboratory.

### **ABSENTEEISM**

Lack of attendance, tardiness to class, and tardy assignments will be excused only with prompt written documentation. Report to class on time! Due to limitations in support personnel, opportunities to make up missed laboratory experiments will be rare, if at all possible.

## GRADING

The overall grading scheme for this course is as follows:

- 30% - Laboratory Reports
- 30% - Laboratory Performance
- 10% - Problem-Based Learning Class Presentation
- 10% - Laboratory Notebook Maintenance
- 10% - Examinations
- 10% - Homework

## LABORATORY REPORTS

The purpose of the laboratory report is to communicate experimental work in writing. The educational goal is to help students learn and practice expressing their ideas and describing their work in a professional manner. With this in mind, the requirements for the structure of the laboratory report are similar to those for peer-reviewed scientific literature:

- Laboratory reports must be submitted in hard-copy format to the instructor or TA directly. Do **NOT** leave reports in insecure places for them to be found by the TA at some unspecified time.
- Acceptable laboratory reports will be no longer than **10 double-spaced pages** with writing on one side of the paper (title page not included). NOTE: Double-spacing allows graders to make comments near the relevant text. The laboratory report for the problem-based learning session cannot exceed 15 double-spaced pages.
- Reports should be written in grammatically correct English, and prepared using a clear font of size 12-point, with at least 1-inch margins on all sides.
- Each page should be numbered at the bottom.
- Laboratory reports should **NOT** be formatted with dual column text as seen in published journal articles.
- Figures should have figure legends describing the figure in sufficient detail underneath the figure. Tables should have headings at the top of the table. Font sizes of text for figure legends or tables may be 8-10 point in size.

**DEADLINES.** Laboratory reports are due one week after scheduled completion of lab work as indicated by the schedule online. The report must be given to a TA or instructor, and dated. Do not put reports in the instructor's mailbox or under his/her door to avoid misplacement of your report. You may submit reports to the Main Office in Boggs or the MSE Building. Delinquent laboratory reports will be graded according to the following schedule:

- 1 day late - deduct 5 points
  - 2 days late - deduct 10 points
  - 3 days late - deduct 20 points
  - 4 or more days late - a grade of "0" will be given for that lab
- Saturdays and Sundays count for one day each!**

*If students need to submit lab reports on Saturday or Sunday, the student must make arrangements to meet the TA in advance. The TA is not obligated to be present to accept laboratory reports on weekends.*

### Laboratory Report Components

- ❑ **Title Page** – (Required) Provide the experiment title, author, partner's name (if applicable), date(s) experiment performed, date handed in, and the author's signature indicating that the laboratory report was the authentic work of the person whose signature is listed and that the Georgia Tech Honor Code was followed.
- ❑ **Introduction** (15 points) - Present background for the experimental work described. State relevant concepts and hypotheses and the objectives of the experiment. Refer to journal articles (**not web sites**) where you have read supportive background information.
- ❑ **Experimental Procedures** (15 points) - Summarize the specialized reagents and their sources and equipment used in the experiment. Generally describe methods used especially where deviations to the protocol were made. Include the level of detail commonly found in published research articles and, only when necessary, add additional details.
- ❑ **Results** (30 points) - Describe the data generated from the experiment in words. Then, present figures (including graphs) or tables of your data for emphasis and clarity. Each figure should have a figure legend underneath the figure - a statement describing the figure itself. Each table should have a table heading above the table. All figures should be clearly labeled. Results sections with insufficient text describing the results and/or key illustrations of data will merit very few possible points.
- ❑ **Discussion** (30 points) - State the overall conclusions from your experiment here. In cases where the work was hypothesis-based, the discussion should address the hypothesis directly. Discuss the significance, implications, comparisons of results to other work, etc. State and critically evaluate any assumptions that were made. Estimate the accuracy of your results. Discuss any observations that you found unusual or unexpected, and why they may have occurred. Note and discuss inconsistencies in your data that make drawing firm conclusions difficult. Discuss improvements that could be made in the laboratory hardware and apparatus that could improve your results.
- ❑ **References** (10 points) - List the references made throughout the text of the research article in the order in which you refer to them in the text. References are required, not optional! Reputable resources should be used as references. **Web sites are not reputable resources for a professional laboratory report.** Avoid referencing your Biochemistry textbook since it contains general information.

## Laboratory Performance/Conduct

- Students are expected to have read the laboratory protocol for the day prior to reporting to class. Note: Be sure to review all links associated with a laboratory protocol.
- Students are expected to follow written procedures for conducting assigned experiments. Due to limitations in equipment, students will be asked to work with the TA/instructor in cycling through the laboratory work.
- Students are expected to work independently (or when necessary, with laboratory partners).
- Students are responsible for the upkeep of their assigned workstations. Be sure to restock all pipette tip boxes at the end of each class period.
- Be sure to clean all glassware before the end of the class period.
- Keep the balance and instrumentation areas clean and free from clutter.
- Be sure to report any malfunctions in equipment to the TA or instructor.
- All materials stored in the refrigerator, freezers, or at room temperature must be capped and clearly labeled with your name and its contents.
- Follow all safety regulations and encourage others around you to work safely as well.
- Do not eat, drink, or chew gum in the laboratory. DO not bring food, including bottled water into the laboratory.
- Do not discard food trash in the laboratory. Do not bring food into the laboratory.

### Laboratory Hazards

Some of the chemicals used in this laboratory are harmful if inhaled or ingested.

- Always wear safety glasses in the Biochemistry Laboratory! Reading eye glasses no longer suffice as suitable safety protection for the eyes.
- Wear suitable clothing in the Biochemistry Laboratory. Sandals and shorts (unless covered by a lab coat) are not permitted in the lab.
- Wear latex gloves when working with dangerous biochemicals.
- Do not allow laboratory chemicals to enter your mouth or small cuts or scratches on your hands. Latex gloves are available for daily use to avoid this problem and to prohibit contamination of laboratory experiments.
- Do not inhale powders or vapors. This is especially important when working with sodium dodecyl sulfate (SDS) powder, concentrated acids/bases, and mixtures of acrylamide and bisacrylamide solutions.
- It is good practice to wash your hands carefully before leaving the laboratory.

- Read and follow instructions.

### **Problem-Based Learning Session**

Problem-based learning (PBL) is a contemporary approach for educating students with “real world problems” as a means of stimulating thinking and consolidating knowledge from a variety of disciplines in an effort to solve a problem or propose a strategy to solve a problem.

CHEM 4581 students will participate in a very short-term PBL experience involving determination of genetic modifications in a food of the student’s choice. Genetically modified organisms (GMO) in foods have some characteristic features in DNA that are not present in natural foods. Students will have two days to complete their experimentation.

Day 1	Extraction of DNA from Food PCR Amplification of DNA
Day 2	Electrophoretic Analysis of PCR Products
Day 3	Oral Presentation of Student Findings

The oral presentation should be no longer than 30 minutes. Students should prepare a Power Point presentation and submit an electronic version of their talk to the instructor prior to the class period on the presentation day. Presentation of results will be evaluated by the instructor and TA.

### **Laboratory Notebook Maintenance**

- All experimental data, except instrument output, should be recorded in indelible ink in a bound laboratory notebook with pre-printed sequential page numbers.
- Students should sign the notebook on the last page of that day’s experiment.
- Do not leave blank pages in a laboratory notebook.
- A lab notebook should include protocols, identification of samples, observations, and data.
- Record data and observations as you obtain or make them. Do not write on scraps of paper with the intention of transferring information to the lab notebook later.
- Do not worry if your notebook is a little messy.
- The recording and organization of a permanent record of laboratory observations is as important a technique to master as any of the experimental methods you learn. The research notebook is a day-by-day record of the progress of experimental work. It should reflect the integrity and honesty of the experimenter as well as the clarity of his or her thought.

## Examinations

During the lecture period, students will be given two comprehensive examinations: Feb 11 and March 31. The examinations will be closed-book and will cover content from the lectures and lab sessions, as well as background reading. In the event that calculations are required, standard calculators may be used, but not shared during exams. Talking is prohibited during the examination period.

No final exam will be given for this course.

## Homework

Homework assignments will be made periodically throughout the term and will usually be given to students during the lecture period (or online). Therefore, attendance at each lecture is strongly encouraged, but not required. Deadlines for each assignment will be made at the time the assignment is given. Be prepared to submit your homework to the instructor in hard copy form by the deadline. **Late homework will not be accepted!**