BIOLOGY/CHEMISTRY 310
METHODS IN BIOCHEMISTRY AND CELL BIOLOGY
TERM I, 2006
PROFESSORS HILL AND LOPRETE

Course Purpose

To a large extent, the study of the cell and its biochemical functions can be seen as the study of proteins. Every function of a cell requires the presence of at least one protein (and usually many more than merely one) in the role of catalyst, processor of information, or essential structural element. A scientist studying a cell containing thousands of different types of proteins must have tools to answer some very basic questions How do we quantify the amount of protein in the cell? How do we identify the different types proteins that are present, and how do we isolate these types for separate analysis? How do we detect and measure the functions that the proteins carry out? One goal of this course is to give you practical and theoretical experience with some of the basic research methods needed answer questions like these.

A further and equally important goal of the course is for you to improve your ability to reason your way through experimental situations in general. A great deal of emphasis will be placed upon your learning how to plan procedures, carry them out accurately and efficiently, and extract appropriate information from the results. These skills are amongst the most valuable you can acquire because they can be exported to situations well beyond their application in the few research techniques learned in this one course.

Scheduling and Credit

BIO/CHEM 310 provides laboratory credit for both Biochemistry (CHEM 414) and Cell Biology (BIO-307). If you take only one of these courses, the remaining hour constitutes elective credit.

The class is scheduled to meet for one afternoon each week. That time may be used for lectures, demonstrations of procedures, work on laboratory projects, or a combination of these things. During most weeks you will also need to schedule additional time for independent work.

The total time spent in coursework (formally and informally) will vary from week to week, but you should expect your overall involvement in course work to be about **double** that of a normal laboratory section. That's why you get two credit hours for the course, rather than just one.

Grading

Your final grade will be determined by the weighted average of your work in the following categories, using a standard "90 – 80 – 70 – 60" scheme for assigning letter grades. Additional "plus" and "minus" designations will reflect your relative position within these ranges.

1. Quizzes (10%)

   At the beginning of most class meetings there will be a brief quiz, which will cover practical and theoretical aspects of all work done since the preceding quiz. In addition, each quiz will cover general aspects of the work that you'll be beginning that day, so you should be sure to read assignments in advance.

2. Laboratory Reports (50%)

Each exercise will result in a written summary or report. (In some cases one exercise encompasses more than one week's work.) The length, goal, format, and credit will vary from report to report, depending on the nature of the work. These expectations will be spelled out at the appropriate times during the semester.

3. Written Exams (20% + 20%)

There will be two examinations, each covering approximately half of the course material. Exams require you to demonstrate a good theoretical understanding of the techniques that you've learned, as well as practical knowledge. That is, you'll be expected to understand what to do to carry out a technique, what the results should look like, how to interpret them, and what may be wrong if they don't look like you expect them to.

4. Other Factors

You're required to attend all scheduled class meetings and to contribute actively and equitably to your team's work. Absence from one lab meeting will allowed without impact on your grade, assuming there is a compelling reason for the absence, and you carry out your work during the rest of the week without undue burden on your lab partner. Further absences, even with explanations, will result in a reduction of your grade, in all but the most extraordinary of circumstances.

In addition, be mindful of the following obligations:

a. You'll be working sometimes with delicate and expensive equipment, which you can damage through ignorance or neglect. Never twist a knob or flip a switch unless you're quite certain what it will do.

b. Many chemicals and some equipment that you'll be using can be dangerous if used improperly. Familiarize yourself with hazards, and consider them to be among the most important things you know about each procedure.

c. Always be neat and clean in your work. A cluttered lab space is dangerous and leads to error and waste. Keep your work organized, and put things back in their proper places when you're done.

d. The supplies of chemicals and disposables that are provided for your work are not limitless and in many cases not at all cheap. If you use more than your share, you will be wasting resources and may be preventing someone else from doing their work altogether.

e. You'll be handling and injecting live animals. Treat them with consideration, and perform these procedures in a manner that causes them a minimum of pain and distress.

You're expected to adhere conscientiously to all the rules of good lab citizenship mentioned here, as well as to all other safe and courteous lab practices. Shortcomings in these regards **will** influence your final grade in the course.

WEEKLY SCHEDULE

Aug.	**23**	**NO CLASS MEETING (Opening Convocation)**
Aug.	30	Immunization of Mice
Sept.	6	Spectrophotometry and Protein Quantification
Sept.	13	Enzyme Assays: Basic Principles (and Booster Shots of Mice)
Sept.	20	Determining an enzyme's pH Optimum
Sept.	27	Enzyme Kinetics (and Collection of Blood from Mice)
Oct.	4	Enzyme-Linked Immunosorption Assays (ELISA)
Oct.	**11**	**FIRST EXAMINATION**
Oct.	18	SDS Gel Electrophoresis of Proteins
Oct.	25	Transblotting (in preparation for immunoblotting)
Nov.	1	Immunoblotting (Western Blotting) and Preparation of Proteins for MS Sequencing and Fingerprint Analysis
Nov.	8	Genetic Transformation of *E. coli* with an expression vector
Nov.	15	Isolation of Transgenic GFP from *E. coli* using Chromatography
Nov.	**22**	**THANKSGIVING BREAK**
Nov.	**29**	**NO CLASS MEETING**
Dec.	**6**	**FINAL EXAMINATION**

Statement on Selection and Citation of Scientific Literature in Lab Reports

When citing books or journal articles, use a bibliographic convention employed in a journal of your choice, and be consistent in its application. When citing a web resource, include the full URL in the Literature Cited section of the report, and be sure the URL actually works. Peer reviewed journal articles (either print or online PDF versions) and library books are considered authoritative resources, upon which the fundamental conclusions of your writing can be based. Most web resources can be used as support for or expansion upon information already well substantiated from authoritative sources, but normally they cannot serve as the principal resource for essential information. You are responsible for telling the difference between authoritative web resources and those that are of questionable value. If in doubt, ask your professor.