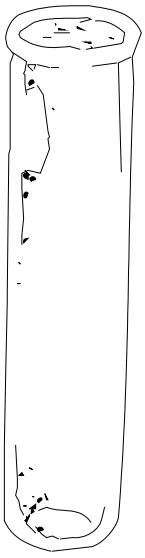
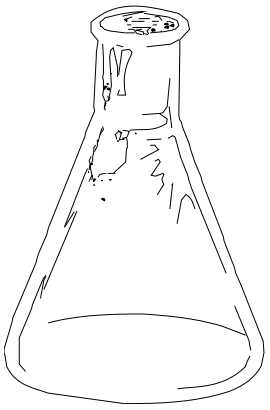
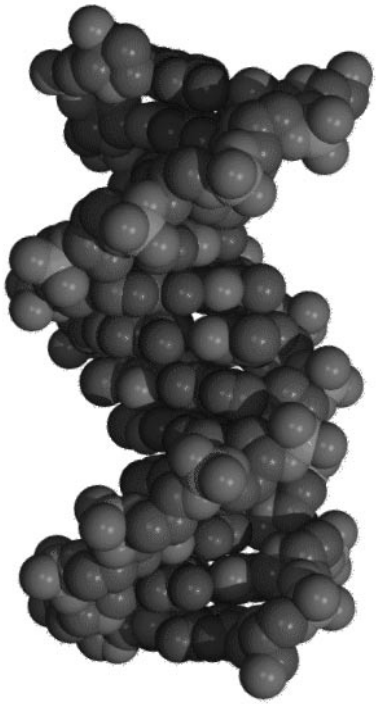


General Biochemistry I (CHEM 461) Laboratory Syllabus



Fall 2009



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Copies of this document are available at the course website: *webhost.bridgew.edu/fgorga/courses/BC-I*

Introduction

The first semester of the biochemistry laboratory has three major themes: bioanalytical chemistry, enzymology and bioinformatics. These themes are **not** mutually exclusive and experiments from each theme will be interspersed throughout the semester.

Bioanalytical chemistry is the science of separating and quantitating biological molecules. In this section you will learn about and perform colorimetric assays for determining the quantity of protein in solution. You will also learn about electrophoresis and chromatography. These techniques are commonly used for the separation of biological macromolecules, especially proteins and nucleic acids. You will also learn about reverse phase chromatography, a separation technique usually used for small molecules.

Enzymology is the study of enzymes. Here you will learn how to perform an enzyme assay and to determine the kinetic parameters of an enzymatic reaction.

Bioinformatics is the application of computers to the analysis of biochemical data. In this class we will concentrate on sequence data (both nucleic acid and protein) and on protein structure. You will use your laptop computer for most of these "experiments".

Required Materials

There is no text or laboratory manual. Instructions and background material for each experiment will be provided as photocopied "handouts".

A permanently bound (not a loose-leaf or spiral bound) lab notebook is required.

The Student's Responsibility and Evaluation of Student Performance

Success in the laboratory depends on preparation; one cannot walk into a laboratory and expect to properly perform an experiment without significant forethought and preparation. Therefore, each student is responsible for reading and understanding each experiment before arriving in the laboratory. Some experiments may entail preparations that need to be completed (and recorded in the lab notebook) before arriving in the lab. Plan ahead!

Students are expected to work individually unless explicitly told otherwise. Students are expected to keep a laboratory notebook and to prepare lab reports in a timely manner and in accordance with the procedures and ideas presented below.

Lab notebooks

Lab notebooks are meant to be a complete and accurate representation of what actually occurred in preparation for and during an experiment. This includes the mistakes and the problems encountered! Many scientists also use the lab book to record their thoughts and interpretations of the data they have collected. It is meant to be a complete record for the scientist who wrote it and others who might need to repeat an experiment. It is not necessarily a beautiful document!

Each page of the lab notebook should be numbered consecutively, in ink. Some lab notebooks can be purchased with pre-numbered pages, if yours is not. All of the pages should be numbered before using the notebook. Each page of the lab notebook should be dated with the date on which it was used. Industrial laboratories require, for patenting purposes, that the scientist and a second "witness" sign each page of every lab notebook. We will not require such formalities here!

The description of each experiment should generally be composed of four sections: an introduction, a protocol, the results and a conclusion. The first two sections should be completed before stepping into the lab to begin the experiment.

The introduction, which can be a short as a sentence or two, gives the reason for doing the experiment. This section usually makes reference to a literature source or to an earlier section of your lab notebook.

The protocol section contains a “recipe” for doing the experiment it should contain a detailed record of all preparations for the experiment, including calculations for making solutions, records of exactly how the solutions were made and the source of all reagents. The protocol section should also contain a detailed list of the steps to be performed in order to make the planned measurements. Sometimes it is necessary (because of unforeseen factors) to modify the protocol during an experiment. Modifications should be accomplished by crossing out and writing over, never by erasure. The things that are crossed out should still be left legible. Erasing in a lab notebook is frowned upon in general.

The result section contains a record of all observations made during the course of an experiment. The exact format of this section will vary greatly depending on the type of experiment. Many times a scientist will attach physical samples or instrument recordings (spectra, for example) to the lab notebook in a result section. It is appropriate to place graphs of raw data or other similar items (which may be prepared after leaving the lab) in this section.

Lastly, the conclusion section contains any thoughts the scientist had about the experiment. This could be as simple as “Repeat this experiment!” and a sentence saying why. Or it could be a paragraph outlining the significance of the result or a suggestion for another experiment based on the current result. It is best to write down your conclusions shortly after completing each experiment since ideas tend to be freshest then.

Lab reports

Reports are formal works that present a scientist's work to an external audience. In many cases lab reports are written documents (as we will stress here), although oral reports are also common. Poster presentations, talks at scientific meetings and journal articles are also forms of lab reports. Sometimes, these reports are made to one's supervisor and are used to determine the resources available for your research or your compensation (raises and bonuses are often based on "lab reports".)

The "English" counts in a lab report. Your goal in writing a lab report is to effectively communicate the results of your experiments. Poorly written reports will detract from the most spectacular data. Use whole, well constructed sentences and logically written paragraphs to write your lab report.

A lab report usually consists of four sections an introduction, a methods section, a result section and a discussion. (Sometimes a fifth section, the bibliography, is added).

The introduction is used to explain why the work you have done is important and how it fits with current knowledge.

The methods section is a concise description of the methods used. Assume that the person receiving the report is a well-rounded scientist who is familiar with biochemistry especially as well as other areas of science. It is not necessary to list every volume that was pipetted, every how every solution was prepared, etc. Those details should be available in the lab notebook.

The result section describes your experimental results. Tables are used to present large amounts of data in a concise fashion. Graphs are used where it is important to show trends or other relationships in a visual manner. Other figures (photos or drawings, for example) are used when appropriate.

Finally, the narrative explaining the significance of your results is placed in the discussion section. The discussion is used to indicate the significance of your results in light of previous knowledge in the field, as well as to point out the unique aspects of your results. A small amount of speculation about where your results may lead is sometimes allowed.