If there is one thing I have learned in this life, it is the fact that we tend to place imaginary obstacles in the way of starting unfamiliar projects. While your previous lab experiences may have been unfamiliar, for the most part you were given a set of directions and a set time to work. As you gain lab skills, however, you are more often confronted with situations where you need to implement new lab methods. Proving your ability to work independently and generate reliable, reproducible results is the overall objective of the biochemistry lab experience.

**Lab Expectations**

You are to choose one of the available labs and working with a partner, plan, prepare, and execute the procedure. The initial instructions are more of an outline describing the lab strategy rather than a detailed procedure to follow. I will be working with you in the lab to answer questions and consult, but if you need more information about the lab procedures, you can find published references describing each of these projects in the scientific literature. I will meet with each group in the first week to flesh-out the strategy and get you moving in the right direction. Also, I want to be present the first time you work through your lab procedure or use the lab equipment. Some of the instruments are dangerous (i.e. the centrifuge) or delicate, and all are expensive. Please don’t use them until you have been trained.

There is no set time for you to be in lab, but I will expect you to spend an average of 10-15 hours in lab per week. There may be procedures, however, that require you to spend many hours in lab on a single day (many enzymes are unstable), while other days may not require much lab work at all. Although you will be working collaboratively on these projects, it is not necessary that both of you are in the lab at the same time. Just make sure that each of you knows what is going on at any given moment to avoid time-consuming mistakes. These are going to be complex, multi-step experiments with numerous opportunities to mess up. You may come in after “normal” class hours to do certain things, however, please keep in mind the rule for equipment use (prior training). It goes without saying that you must keep a lab notebook to document your methods and results for your final report. I will occasionally ask to see your notebook but will not grade it. Lab notebooks and reports are written individually.

**Lab Grading**

There are two grades for the lab. A total of 25 pts are possible for lab work and will be awarded based on your preparations for, presence in, and documentation of lab activities. There aren’t specific rules for how these points will be scored; it is simply a matter of how well you engage yourself as a scientist. Notebook entries, experimental progress, and your ability to explain what is going on in casual conversation are obvious ways to document this quality. The remaining 75 points are based on the lab report. We will discuss the rules for the lab report later in the term, but a large part of this grade is based on how well you establish that your data is reliable, meaning that it is reproducible and supported by appropriate control samples, and that it answers a simple question relevant to your project.

**Lab Advice**

The ability to take a published procedure and turn it into a reliable laboratory method is not a trivial undertaking. Fortunately, half the battle is in taking the time to understand what needs to be done or prepared before you start working in the lab. Organize your thoughts and time by reading through the procedure to identify equipment (e.g. fraction collector) and solutions that need to be prepared (e.g. buffers). Taking this prep-time will dramatically improve your efficiency and productivity in lab and help you accomplish your lab goals. Don’t forget that I am available to help sort out problems, but you need to seek

It is also beneficial to think about how to analyze lab data before collecting it. If you plan to average data from several samples, it would be a good idea to treat them simultaneously, not one at a time. It is also a good idea to analyze data as you go instead of waiting until the end of the term when you write the lab report. Analyzing data “on the fly” can identify problems early enough in the process that you can make changes to the experimental design, not after you have cleaned up and thrown things away.
Lab Safety

Lab hazards in a biochemistry lab are somewhat deceptive; most of what we deal with are dilute, aqueous solutions near a neutral pH. While you will encounter the occasional flammable solvent, your level of exposure is quite a bit less than that of the organic lab. Nevertheless, you do have the potential for exposure to various enzyme inhibitors or artificial substrates that could prove toxic should you stick some in your eye. Because of the inherent risks from working in a lab, the Federal government has developed a set of regulations requiring that employers provide their employees with information about hazards in the workplace. As you may have guessed by now, these regulations also apply to academic institutions, and this document is part of our Chemical Hygiene Plan alerting you to the hazards you may be exposed to while working in the lab.

One of the main provisions in a Chemical Hygiene Plan is informing you about the hazards of any chemicals used in the lab. I will notify you of specific chemicals that warrant special attention, but if you wish additional information about toxicity, potential health effects, or exposure controls for other compounds, you should consult the Material Safety and Data Sheets (MSDSs) that are on file in the stockroom or available online. While these MSDSs are usually complete, you should never assume that all hazards of a specific chemical have been identified.

The other responsibility I have is to notify you of the types of hazards inherent in the lab. I have outlined a few general hazards you may encounter when working in the lab. You must realize, however, that it is not possible to define all the specific circumstances that you will face; therefore, I expect that you will exercise a certain amount of common sense when handling chemicals and using equipment. The best rule of thumb for safe work habits,

“If you have a dumb question, ask it anyway!”

Potential Hazards

Minimizing chemical exposure hazards: Despite the function of our skin to keep out dirt and keep us from spilling all over the floor, it is only a selectively impermeable barrier. Certain materials such as solvents can be absorbed through the skin and can act as transport media for organic compounds (think about nicotine patches). Eyes, of course are excellent avenues of entry for toxic materials, not to mention easy to burn with caustics.

Minimizing risk of cuts: The most common lab injury is hand injuries from broken glass. To minimize risk, glass tubes, stems, or thermometers should be lubricated with glycerol or mineral oil before inserting them in stoppers or tubing. You should also wear heavy gloves or use paper towels to protect your hands when making the insertion. If you don’t want to bother going to the trouble of doing all that, ask to see my scar.

Things your mother would warn you about if she were here: This list is simply a reminder of the usual things.

- Wear eye protection whenever someone is working in the lab. Glasses should fit snug to your face limiting the possibility of splashing up from underneath and dripping down from above. Take the time to adjust them.
- Use the appropriate gloves when working with hazardous materials. Not all gloves are impermeable to organic compounds and you must consult a glove guide to identify what glove material is suitable for the chemicals you are working with. Nitrile and polyethylene gloves offer the best all around protection, but there are limitations to these materials.
- Know the location of the eye wash, fire pulls, fire extinguishers, exit routes, and safety showers.
- No food or drink in the lab. The worst thing for you is a snack laced with some nasty carcinogenic chemical that wasn’t intentionally put there by the manufacturer.
- If you suffer any significant chemical exposure (i.e. spills or splashes on your hand, fumes in your face, etc.) you must notify the instructor immediately.
- If you are ever concerned about safe working conditions in this lab, immediately notify the instructor.
Chemical Waste Disposal

Waste disposal is another important part of a chemical hygiene plan. Of course, the best practice is not to generate the waste in the first place. Nevertheless, we will make waste and need to know what to do with it. Generally, aqueous wastes containing buffering salts, biological goo, or enzymes can be disposed of in the sink. Anything else (organic compounds, solvents, etc.) needs to be contained in a waste container, and by Federal law, the container must be labeled with the word ‘Waste’ (imagine the debate on the floor of Congress for that one). We will provide one for the class and if you have any questions about what should be thrown away and how, be sure to ask an instructor. If the waste container is nearly full, please let an instructor know so we can get another set up before things overflow.

The Hiney Hider Clause

Before you are allowed to start working in lab, you will need to sign my safety notebook indicating that you are aware of this document, that I actually gave you a copy of it, that you have had time to ask questions about points I mentioned in this discussion, and that you agree to follow these guidelines. Your signature does not waive any rights or exclude Cornell College from liability; it is simply acknowledging that we took the time to discuss safe lab practices with you.