BIOCHEMISTRY 3723
Biochemical Laboratory
Syllabus, Spring 2011

Lecture in 348 B NRC: Lab in 144 NRC:
TR 12:30 ~ 1:30 PM TR ~1:30 – 4:00 PM

Instructors: Dr. Donald D. Ruhl, 348F NRC, x4-6409 email: donald.ruhl@okstate.edu
Office Hours: MWF 10:00-11:00, or by appointment
Ms. Judy Hall 143 NRC, x4-6204 email: judy.hall@okstate.edu
Gloria Perez, Teaching Assistant

Pre/Corequisite: BIOC 3653 or 3713–If you are currently enrolled, please tell me right away.

Goals:
1. To familiarize you with properties of biological molecules that can be exploited for their separation, identification, and quantitation.
2. To introduce you to the instruments commonly used by biochemists and teach you their usefulness and their limitations.
3. To give you experience using experimental biochemical methods.
4. To develop your analytical reasoning and problem solving skills.

Biochemistry 3723 Lab Manual: Biochemical Laboratory, Spring 2011

If the lab manual is not on the shelf in the Student Union Bookstore, ask for it at the textbook office. A copy will be made for you. It should not take more than one day; Do not accept a lab manual from last semester.

Lab Notebook. Should be graph paper design with numbered pages. Doesn’t need carbon duplicates.

Website: Desire 2 Learn (D2L) http://oc.okstate.edu

Computers: Macintosh Computers are available in the lab and in Room 260 NRC, 8 AM-5PM, weekdays.

Reading Assignments:
1. You need to read and understand the experiments before coming to class. Pre-lab assignments will be posted on D2L and will be due at 8:30 a.m. the day of the lab (either in my email box or in the box outside of lab, NRC 144).
2. Assigned readings listed at the beginning of each experiment should be done before class.

Teaching Style: I am counting on you to read the material before class and to ask questions. This is a laboratory course; therefore it is “hands-on”. Our goal is to get you into the lab with the understanding of the experiment, not to do the experiment and understand it later.

Schedule: The schedule of experiments and a calendar are found on pp. 3 – 4 of the lab manual. Some experiments require work outside of the normally scheduled laboratory time. We have
made every effort to keep this extra lab time to a minimum, but until we can find a way make science keep bankers' hours, you will have to do some work at odd times.

**Grading:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Lab reports (16 @ various points)</td>
<td>430</td>
</tr>
<tr>
<td>Quizzes and Pre Labs</td>
<td>130</td>
</tr>
<tr>
<td>Exams (3 @ various points)</td>
<td>300</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>860</strong></td>
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1. **Exams**: Three exams will be given. Every exam is "cumulative".
2. **Lab Reports** are to be written on the forms provided in the lab manual, unless otherwise stated. See p. 5 of the lab manual for detailed instructions on lab reports and policy about accepting late lab reports.
3. **Quizzes, and pre-lab assignments**: At least one safety quiz will be given. Pre-lab assignments will be posted on D2L, and will be due at 8:30 a.m. either in my email box or in the box outside of lab, NRC 144. The purpose of the pre-labs is to encourage you to come to the lab prepared to work and to help me determine how the lecture time can best be spent.
4. When preparing lab reports and pre-lab assignments, you may discuss your work with anyone, however you are not allowed to directly copy nor plagiarize from anyone, books, or the internet. Points will be deducted for plagiarism of published work or direct copying from another student.
5. **Guaranteed Grades**: A = 750; B = 640; C = 530; D = 420
6. If more than three lab reports are missing at 12:00 PM on Friday of dead week, April 29, 2011, an automatic grade of "F" will be given in the course.

**Data Verification**: In the real world (i.e. industry, research lab, hospital), a laboratory notebook is a legal document. Therefore, it is necessary to have all data verified by having it countersigned by your work supervisor. Data should be recorded in non-erasable ink in a bound notebook. (Actually it should be recorded in duplicate and the two copies stored separately so data isn't lost if something happens to the notebook). In this class record data IN INK on the report forms in the manual or in the lab notebook when assigned. Have your data initialed by the instructor before leaving the lab each day. All raw data must be turned in with each lab report.

**Attendance**: Attendance is mandatory. This is a hands-on course, thus you must be present. If you are late for lab, points will be deducted from your grade. If you must miss lab, let the instructor know as soon as possible (by telephone, as email is not always reliable). If the absence is excused we will try to arrange for you to do the experiment at a different time. If it is not possible to make up the experiment, you may write the report using your partner's data. However, you will be assigned extra work to make-up the missed experiment. This consideration can be given only for one excused absence because the experiments are designed to give you hands-on experience. All non-excused absence will result in a zero for that experiment.

**Academic dishonesty and misconduct**: Oklahoma State University is committed to the maintenance of the highest standards of integrity and ethical conduct of its members. This level of ethical behavior and integrity will be maintained in this course. Participating in a behavior that violates academic integrity (e.g., unauthorized collaboration, plagiarism,
multiple submissions, cheating on examinations, fabricating information, helping another person cheat, unauthorized advance access to examinations, altering or destroying the work of others, and fraudulently altering academic records) will result in your being sanctioned. Violations may subject you to disciplinary action including the following: receiving a failing grade on an assignment, examination or course, receiving a notation of a violation of academic integrity on your transcript (F!), and being suspended from the University. You have the right to appeal the charge. Contact the Office of Academic Affairs, 101 Whitehurst, 405-744-5627, academicintegrity.okstate.edu.

Disabilities: If you have special needs, please contact Dr. Ruhl as soon as possible so that we can work with you and the Office of Disabled Student Services (326 Student Union) to provide reasonable accommodations for you.

Oklahoma State University Syllabus Attachment: We are very concerned about your success as a student at OSU. The information at the following link is provided to answer questions most often asked by students. http://osu.okstate.edu/acadaffr/aa/syllabus.htm.
Biochemistry 3723 Learning Outcomes:  
Spring 2011

Lab Competency: General Laboratory Procedures

At the end of this course the student should be able to:

1. demonstrate the safe and accurate use of basic laboratory equipment such as
   a. pipets
   b. balances
   c. pH meters
   d. spectrophotometers
   e. chromatography controllers
   f. electrophoresis units
   g. centrifuges (high speed and microfuges)

2. calculate parameters resulting from appropriate use of the above mentioned laboratory equipment.

3. evaluate data generated with an understanding of significant figures, precision and accuracy.

4. design and carry out a protocol to answer specific biochemical questions.

5 interpret and report results and conclusions resulting from carrying out protocol in clear language, with appropriate calculations, diagrams and graphs (all appropriately labeled).

Specific Biochemical Competency

At the end of this course, the student should be able to explain basic scientific concepts relating to the study in the laboratory of the following areas of biochemistry and molecular biology: structure and isolation of proteins, structure and isolation of nucleic acids, experimental approaches to understanding metabolism, experimental techniques used in molecular biology, use of databases to evaluate protein and nucleic acid sequence.

Specifically, the student should be able to:

1. demonstrate the proper preparation and measurement of general solutions, (Exp 1-3).
   a. buffers, using Henderson-Hasselbalch equation to calculate how to prepare a buffer.
   b. colorimetric assays used to determine the concentration of a chromophore in solution.
   c. absorption spectrum to identify and quantify chromophores.

2. design and execute the purification of a protein, showing understanding of enzyme assays and colorimetric assays to evaluate the protocol (Exp 4-7).
   a. demonstrate understanding of principles of bulk purification steps.
b. demonstrate understanding of chromatographic procedures, including size exclusion, ion-exchange, affinity, hydrophobic interaction.

c. demonstrate understanding of principles of SDS-PAGE for separation of biomolecules

d. demonstrate understanding of principles of MALDI.

e. evaluate purification using standard techniques of enzyme and protein concentration assay

f. evaluate results of purification by comparison of results with information collated in web-based databases.

3. understand and evaluate kinetic interaction of enzymes, substrates and inhibitors (Exp 8).

   a. calculate and classify kinetic constants.

   b. predict/describe mechanism of inhibition based on evaluation of kinetic patterns.

4. use process of scientific inquiry to analyze/explain cellular metabolic processes (Exp 9) by calculation and interpretation of experimental data to describe metabolic process in catabolite utilization.

5. demonstrate techniques of nucleic acid isolation, manipulation and analysis (Exp10-12).

   a. compare and interpret results of manipulation of various DNA samples.

   b. experience and understand use of databases to analyze sequencing results.

   c. organize results in larger context of known DNA sequence using web database.

6. extract and interpret relationships among samples from experimental results. (Exp 13-14)

   a. construct DNA map from restriction analysis.

   b. interpret relationships between DNA samples (probe vs probee).

   c. explain/interpret results of PCR of biological sample DNA.
BIOCHEMISTRY 3723
Spring 2011

Name ________________________________ Local Phone No. __________________
email address : ______________________

Major ________________________________ Hours completed __________________

Advisor's Name/Department: _____________________________________

Please list (circle) the courses you have had:
Chemistry and biochemistry courses:

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<tr>
<th>OSU Course Number</th>
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<tbody>
<tr>
<td>General Chemistry  CHEM 1314/1515</td>
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<tr>
<td>Analytical Chemistry CHEM 2113</td>
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<tr>
<td>Organic Chemistry CHEM 3053 / 3112 / 3153</td>
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<tr>
<td>Physical Chemistry CHEM 3433 OR BIOC 4224</td>
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<tr>
<td>Survey of Biochemistry BIOC 3653</td>
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<tr>
<td>Biochemistry I BIOC 3713</td>
</tr>
<tr>
<td>Biochemistry II BIOC 3813</td>
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<tr>
<td>Other Biochemistry BIOC 2101 / 2200 / 4113 / 4883</td>
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Biology courses:

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<th>OSU Course Number</th>
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<tbody>
<tr>
<td>General Biology BIOL 1114</td>
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<tr>
<td>Intro Zoology or Botany ZOOL 1604 / BOT 1404</td>
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<tr>
<td>Intro Microbiology MICR 2123 / 2132</td>
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<tr>
<td>Genetics BIOL 3023 / ANSI 3423</td>
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<tr>
<td>Physiology ZOOL 3204 / 4215</td>
</tr>
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<td>Other (please list)</td>
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What are your reasons for taking BIOC 3723 (other than that it is required for your major)? Please mention any specific techniques you wish to learn.

If you are working on a research project, describe it briefly. In whose lab are you working?

When do you plan to graduate? What are your plans/goals after graduation?