CHEM 3753: Introduction to Biochemical Methods
Fall 2014

Instructor: Dr. Christina Bourne
Email: cbourne@ou.edu (please use “CHEM3753” in subject)
Office: SLSRC 2610
Action Center: Wednesdays, 4 pm – 6 pm Wagner Hall 245
Office Hours: Thursdays, 3:30 pm – 5:30 pm at my office
Also available by appointment

Classroom Lecture: Wednesdays, Fridays 2:30 pm – 3:20 pm, Nielson Hall 170
Online Content: learn.ou.edu
Laboratory Sections: PHSC 310 (You must check in for the first lab session)

<table>
<thead>
<tr>
<th>Section</th>
<th>Date &amp; Time</th>
<th>TA</th>
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<tbody>
<tr>
<td>011</td>
<td>Mon., 10:30 am – 1:20 pm</td>
<td>Brett Roberts</td>
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<td></td>
<td></td>
<td>Contact: <a href="mailto:brett.l.roberts@ou.edu">brett.l.roberts@ou.edu</a></td>
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<td>Office Hours: TBA</td>
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<td>012</td>
<td>Mon., 1:30 pm – 4:20 pm</td>
<td>Juan Nunez</td>
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<td>Contact: <a href="mailto:juan.nunez@ou.edu">juan.nunez@ou.edu</a></td>
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<td>Office Hours: TBA</td>
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<td>013</td>
<td>Tues., 8:30 am – 11:20 pm</td>
<td>Nathan Lavey</td>
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<td>Contact: <a href="mailto:nathan.p.levy@ou.edu">nathan.p.levy@ou.edu</a></td>
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Required Materials:
- Laboratory Notebook
- Safety Goggles (not safety glasses, if you don’t know the difference check on-line for pictures) – you will not be permitted in the lab without them
- A non-graphing calculator for each class and lab (sharing will not be acceptable).

Prerequisites:
CHEM 3653 or concurrent enrollment
Course Description:
This is a one-semester survey of current and routinely used methods in biochemistry. The course will explain the theory of each technique in lecture (2 hours per week) and the execution of these through hands-on lab work (3 hours per week).

Course Goals:
The course is designed to give students an intermediate level of competency in understanding and performing common biochemical experiments. This knowledge provides a foundation for future studies in biochemistry-related careers and medical fields.

Learning Outcomes:
Upon completion, the student should be able fulfill these statements about the experiments used in the lab/lecture:

- Evaluate the basis of why you would do certain experiments
- Explain what physical phenomena is being tested
- Extrapolate from experimental results back to starting material properties
- Troubleshoot why experiments would give unclear (or wrong!) results

In particular, students should know how to:

- Make up solutions to a given molarity and to calculate dilutions
- Use Excel and the Solver plug-in, line fits
- Be able to calculate pH using the Henderson-Hasselbalch equation
- How PCR reactions work
- Design of protein expression vectors and how they work
- How to quantify DNA and proteins
- How to purify proteins using chromatographic methods
- How to characterize proteins and small molecules by spectrophotometry
- How to measure and analyze the kinetic activity of selected proteins
- How to assess the mode of inhibition in enzymatic activity assays
- Michaelis-Menton kinetics

Breakdown of Course Grading Policy

A = 90 to 100% of points earned
B = 80 to 89%
C = 70 to 79%
D = 60 to 69%
F = below 60%

Check your grades carefully when they are posted! If you feel a mistake has been made you must bring it to my attention within the first week of posting – no corrections will be made beyond this point.
<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Lab Exercise</th>
<th>Covered This</th>
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<tbody>
<tr>
<td>1</td>
<td>Aug. 18 – Aug. 22</td>
<td>Check – In Activity: Pipette Calibration</td>
<td>Ch. 1, Ch. 2.3-2.6</td>
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<td>2</td>
<td>Aug. 25 – Aug. 29</td>
<td>Lab 1: Spectrophotometry</td>
<td>Ch. 2.7-2.8, Ch. 3</td>
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<td>3</td>
<td>Sept. 1 – Sept. 5</td>
<td><strong>No Labs this week – Labor Day</strong></td>
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<td>Lecture as normal</td>
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<td>4</td>
<td>Sept. 8 – Sept 12</td>
<td>Lab 2: pKₐ of Fluorescein</td>
<td>Ch. 3</td>
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<td>5</td>
<td>Sept. 15 – Sept. 19</td>
<td>Lab 3: Ion-Exchange Chromatography</td>
<td>Ch. 5</td>
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<td>6</td>
<td>Sept. 22 – Sept. 26</td>
<td>Lab 4: Gel Filtration Chromatography</td>
<td>Ch. 5</td>
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<td>7</td>
<td>Sept. 29 – Oct. 3</td>
<td>Lab 5: Purify genomic DNA, PCR amplification of <em>AdhP</em></td>
<td>Ch. 13, Ch. 14</td>
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<td><strong>Lab Performance Quiz 1</strong></td>
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<td>8</td>
<td>Oct. 6 – Oct. 10</td>
<td>Lab 6: Visualize PCR product, TOPO cloning, Transformation of <em>E. coli</em></td>
<td>Ch. 13, Ch. 14</td>
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<td><strong>No lecture Oct. 10th</strong></td>
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<td>9</td>
<td>Oct. 13 – Oct. 17</td>
<td>Lab 7: Minipreps, Restriction Digest Analysis</td>
<td>Ch. 13, Ch. 14</td>
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<td><strong>Lab Performance Quiz 2</strong></td>
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<tr>
<td>10</td>
<td>Oct. 20 – Oct. 24</td>
<td>Lab 8: Purification of AdhP enzyme, concentration determination</td>
<td>Ch. 4, Ch. 7, Ch. 9</td>
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<td><strong>Mid-term Exam Oct. 22nd 2:30 – 3:20 pm</strong></td>
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<td>11</td>
<td>Oct. 27 – Oct. 31</td>
<td>Lab 9: SDS-PAGE and Western Blotting</td>
<td>Ch. 6</td>
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<td>12</td>
<td>Nov. 3 – Nov. 7</td>
<td>Lab 10: Western Blotting continued, Enzyme Activity Assay</td>
<td>Ch. 9, Ch. 10</td>
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<tr>
<td>13</td>
<td>Nov. 10 – Nov. 14</td>
<td>Lab 11: Kinetics of AdhP – determine $K_m$, $V_{max}$, $k_{cat}$</td>
<td>Ch. 10, Ch. 11, Ch. 12</td>
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<tr>
<td>14</td>
<td>Nov. 17 – Nov. 21</td>
<td>Lab 12: Kinetics of Inhibition of AdhP</td>
<td>Ch. 11, Ch. 12</td>
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<td>15</td>
<td>Nov. 24 – Nov. 28</td>
<td><strong>No Labs, No Lecture – Thanksgiving Break</strong></td>
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<td>16</td>
<td>Dec. 1 – Dec. 5</td>
<td>Complete labs, Check-out</td>
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<tr>
<td><strong>Dec. 10th</strong></td>
<td>Complete labs, Check-out</td>
<td><strong>Comprehensive (Written) Final Exam 4:30–6:30 pm</strong></td>
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Examinations and Quizzes

Class quizzes, 10 points each
only the highest 6 scores will be counted
Mid-term Exam, 10-22-14 = 115
Final Exam, 12-10-14 = 175

= 60

Mid-term Exam, 10-22-14 = 115
Final Exam, 12-10-14 = 175

= 115 + 175 = 350

Lab Notebooks and Lab Quizzes

Activity: Pipette Calibration = 5
Lab 1: Spectrophotometry = 15
Lab 2: pK_a of Fluorescein = 15
Lab 3: Ion-Exchange Chromatography = 15
Lab 4: Gel Filtration Chromatography = 15
Lab 5: Purify genomic DNA, PCR amplification of AdhP = 30
Lab 6: Visualize PCR product, TOPO cloning, Transformation
Lab 7: Minipreps, Restriction Digest Analysis = 15
Lab 8: Purification of AdhP enzyme, concentration determination = 30
Lab 9: SDS-PAGE and Western Blotting
Lab 10: Western Blotting continued, Enzyme Activity Assay = 15
Lab 11: Kinetics of AdhP – determine K_m, V_max, k_cat = 15
Lab 12: Kinetics of Inhibition of AdhP = 15
Performance Quiz 1 & 2 = 15

= 250

TA discretionary points = 50

TOTAL for Course = 600

Examinations and Quizzes

• In-class or online quizzes and homework assignments, worth 10 points each, will be held at the instructor’s discretion.
• You should come to class prepared for every lecture,
• This includes bringing your own calculator.
• There will be no make-up quizzes.
• Consult with d2l prior to each meeting date to stay current with class requirements (including online quizzes).
• The mid-term and final exams will be comprehensive to-date.
• Make-up exams will only be allowed only with prior approval or appropriate documentation per university guidelines.
Stuff to know for the lab section

Laboratory Safety and Supplies

The University of Oklahoma takes great pride in the advanced instrumentation available during courses such as CHEM 3753. This equipment is expensive and must be treated with respect and care. If you are unsure of an activity please ASK FOR HELP.

- **Protect your eyes and yourself** – Always wear your safety goggles in the lab. Failure to wear them will result in a penalty from the “lab technique” portion of your grade. Further infractions will result in dismissal from the lab. ABSOLUTELY NO OPEN TOED SHOES – you will not be admitted to the lab and your grade will be penalized. Floppy clothing and jewelry should be avoided and long hair should be tied back. Wash your hands before leaving the lab. Store your personal items (backpacks, etc.) in the provided cubbies to avoid contamination.

- **Safety Equipment** – Your TA will point out the location of safety showers, eye washes, fire extinguishers, first aid and chemical spill kits. If an accident occurs inform the TA right away!

- **Do Not Sit on the Floor Outside the Lab** – The floors of labs are not always clean and may contain residues or glass splinters. Sitting on the floor is also a trip hazard for those walking by.

- **Chemical Waste** – DO NOT POUR ANY WASTE DOWN THE DRAIN unless instructed to do so. Your TA will instruct you where to put aqueous and organic wastes.

If you don’t know, ASK! Be prepared and organized, keep your station tidy.

Lab Notebooks

- Every student is responsible for keeping their own lab notebook
- Yours should not read identically to any other student’s
- Bring it to every lab class.
- Entries in the notebook should be made in ink, directly into the book
- Entries should be up-to-date.
- THEY ARE TO BE HANDWRITTEN AND MUST BE LEGIBLE.

Put these items IN the Lab Notebook (see your TA’s syllabus to confirm these details)

**Before you do the experiment in lab: Pre-lab report.**

- It is intended to prepare you for the day’s experiment.
- The TA will initial it during that experiment time.
- Failure to prepare a pre-lab report will result in dismissal from the lab and a partial loss of credit for that lab’s report.

The pre-lab report should contain:

1. a summary page with a synopsis of the experiment, purpose, and highlights of the steps to follow and
2. a flowchart (outline) of the chronology and details for each step you will follow in the experimental procedure, including reaction times, temperatures, etc.
**During execution of the experiment: Lab report.**

- You will turn this in as a (carbon) copy for a grade.
- It is due at the next lab session after completing the experiment.
- Late reports will be assessed a 10% penalty per day.

The lab report should contain:

1) **Materials and Methods:** This section is the flowchart from the pre-lab, but has added the actual details of the experiment (exact times, temperatures, etc.). Be as detailed as possible, as minor changes can have unforeseen consequences in the obtained results.

2) **Results & Observations:** Record the data and observations directly in the notebook as they are obtained.

3) **Discussion:** Analyze your data – did you obtain the expected results, what were the expected results, if you did not, why?

4) **Conclusions:** Based on the results and discussion, make conclusions and suggest what future experiments could be done to build on these results.

5) **Questions:** Some labs include questions - this is the section to answer them.

**There are no make-up labs.** If you must miss a lab due to illness or other university approved reason (documentation will be required), you may use your lab partner’s data for that lab to prepare your report. It is still due one week after completion of the experiment (and it should not be identical to your partner’s).

**TA discretionary points** will be explained more thoroughly in the lab, but essentially increments will be taken away for infractions in lab safety and procedures.

**The laboratory is the jurisdiction of the individual TAs,** and they may institute additional requirements. If you feel the TA has not satisfied their duty please let me know, but be advised that the TA’s are highly regarded graduate students within the department – in other words, be certain it is a legitimate grievance.

**Inventory**

To do experiments, you have to have stuff. During the first lab session you will be assigned a drawer of lab supplies.

- Immediately check for breakage or missing items
- All items must be checked back in at the end of the semester
- Failure to check out will result in a $75 fine
**Academic Integrity**

All students are expected to conform to college-level standards of ethics, academic integrity, and academic honesty. By enrolling in this course, you agree to be bound by the Academic Misconduct Code published in The University of Oklahoma Student Code (http://studentconduct.ou.edu/).

All members of the community recognize the necessity of being honest with themselves and with others. Cheating in class, plagiarizing, lying and employing other modes of deceit diminish the integrity of the educational experience. None of these should be used as a strategy to obtain a false sense of success. The need for honest relations among all members of the community is essential.

**Religious Observance**

It is the policy of the University to excuse the absences of students that result from religious observances and to reschedule examinations and additional required classwork that may fall on religious holidays. Schedule conflicts such as these should be brought to the instructor’s attention at the beginning of the semester.

**Reasonable Accommodation Policy**

Students requiring academic accommodation should contact the Disability Resource Center for assistance at (405) 325-3852 or TDD: (405) 325-4173. For more information please see the Disability Resource Center website http://www.ou.edu/drc/home.html.

Any student in this course who has a disability that may prevent him or her from fully demonstrating his or her abilities should contact me personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate your educational opportunities.