



THE UNIVERSITY OF ARIZONA,

Department of Biochemistry and Molecular Biophysics

Biochemical Laboratory Techniques

Welcome to BIOC 463A Spring 2012

Instructional Staff:

- Dr. James T. Hazzard, Course Coordinator
- TA's and Preceptors t.b.a.

Format of Course:

- 1 hr. lecture and 3 hrs. lab.
- 1st half of semester: learn individual techniques.
- 2nd half of semester: apply techniques to systematic biochemical investigations

Course website:

www.biochem.arizona.edu/classes/bioc463a/463a.html

- Announcements and need to know info.
- Course Syllabus (READ THOROUGHLY NOW!) = *“Do I really want to be here or do I want to fill out a Drop-Add form now?”*
- Lab Schedule
- Downloadable protocols (*.pdf format)
- Textbook readings.
- Lecture Notes (.pdf)
- Special Research Project
- Information about Molecular Graphics
- Literature References
- BMB Guide to Scientific Writing (.pdf)

Emails:

- Include “463A” in subject line
- Send by a reasonable time in the day (i.e. before 6 pm)
- Please limit question to something that can be answered briefly
- Questions requiring lengthy discussion are better left for face to face meeting

Biochemistry:

- One of the most demanding majors at the UA in terms of course material and time.
- Only major with a Sr. Thesis requirement in CoS.
- Something you should be passionately interested in AND want to do (i.e., research).
- **Will NOT guarantee you get into medical school. In fact many premmies experience their first “B” in Biochemistry!**

Remember:

“Your worth as a human being is not determined by how much, or how little, Biochemistry you know!” Professor Michael A. Wells

Objectives and Intentions of Course:

- **1st**: Introduction to tools (mechanical and intellectual) and methods used in biochemical research
- *For those already working in labs, hopefully you will begin to understand the “hows and whys” in your lab*
- **2nd**: Help REINFORCE and SOLIDIFY the material you learn in BIOC 462
- *There is to be NO MENTAL DISCONNECT between Bioc 463a and Bioc 462!*
- **3rd**: Give you some insight into the excitement and thrill of research AND a realistic dose of what it takes to be able to design, carry out, and interpret the results obtained from an experiment
- **4th**: Help prepare you for your Sr. Thesis project (doing and writing)
- *In this course you will write and write and write, so be prepared and forewarned!*
- **5th**: Have fun doing biochemistry, “*because if it isn’t fun, it’s not worth doing!*” (the late Professor and Department Head Herb Carter)

EVERY bit of information in EVERY biochemistry textbook comes from people, just like you, engaged in scientific research.

- In Bioc 462A/B you learn to Talk the Talk
- In Bioc 463A and your Sr. Research Thesis you ***BEGIN*** to Walk the Walk!

In the scientific disciplines you must be able to think on your feet, drawing upon your experiences and knowledge. No one will be impressed with how little you know OR can explain!

Therefore: I will ask a lot of questions in class AND I expect an intelligent answer within ~ 15 - 20 seconds!! If you have a problem with being directly asked questions:

- get over it
- or **DROP THE CLASS!**

Do Yourself a Very Big Favor, Become Engaged with:

- ***This Course***
- ***Your Major***
- ***Your Department***
- ***Your Future Career***
- ***Life***

Now the details!

You must keep a Lab Notebook:

- Date of Expt.
- Purpose of Expt.
- Copy of Flow Chart.
- Reagents, Buffers, etc. used (pH, concentration).
- All calculations (write out equations).
- Raw data (spectra, tables, plots, etc.).
- Empirical observations made during expt. (“I forgot to”).
- Literature references (“How does my data compare with literature values obtained from papers handed out in class”).
- *Can my notebook pass the “Shake Test”?*
- ***Failure to have a notebook will result in 2 pts being deducted from each lab report until you comply!***

Why is this important?:

- *A reminder of what you actually did*
- *Notebook is the property of the granting agency (NIH, NSF, Hughes, UBRP, etc.) paying for your research*
- *NB&B has dedicated an entire section to this subject! (Sec. 1.5, pps. 9 – 12)*

Flow Chart: (see Flow Chart.pdf in Syllabus).

- Must be made before coming to Lab. We can determine whether you have done this or not via the Pop Quizzes!!!!
- We will routinely check your flow charts!
- Keep a copy for your own use during lab.
- Two parts:
 1. One or Two sentence statement of the **SCIENTIFIC PURPOSE** of the experiment. *It is very important to know **WHY** you are doing the experiment.* For example: “The purpose of this study is to experimentally determine the pKa of p-nitrophenol using the spectroscopic properties of the protonated and deprotonated forms of the molecule”.
 2. Typical lab flow chart diagram. It is equally important to know **HOW** you are going to do experiment, especially if you hope to finish in the allotted time.
- **Failure to produce a Flow Chart will result in 2 pts being deducted from that Lab Report!**

Lab Reports :(see course homepage for suggestions, tips, and advice) *Worth 20-30 pts (20 for experimental and 2 pts per question); final AP manuscript worth 100 pts.*

- **Not just BUSY WORK!!!!**
- **Enable you to show how well (or little) you understand the material**
- **Initial report: plot and intelligently describe the data, including a Calculations Section**
- **Answer questions at end of protocol**
- **Subsequent reports: written as a manuscripts for the journal *BIOCHEMISTRY***
- **Paper is graded by “Reviewer” (i.e. TA), take Reviewers comments and suggestions seriously. *Grading becomes increasingly more severe as semester progresses!***
- **Spelling and grammar are important!!! Points will be deducted for these mistakes.**
- **Due Tuesday after experiment is completed.**
- **LATE Reports: 2 pt. (10 pts for AP manuscript) deducted for each day late. No reports accepted after Friday.**
- **Failure to turn in first two lab reports will result in Administrative Drop**

A Lab Report, Manuscript, or Paper is a Story Telling Exercise

- ***Every good story teller knows WHY the story is being told (the lesson to be learned), therefore knows the ending***
- ***What makes a good or bad story is how you get to the ending***

Before getting bogged down in the details of the experiment itself (i.e. the protocol):

- ***Know the scientific reason for doing the experiment (Flow Chart)***
- ***Look at what data you are expected to present in your Report (material at end of protocol)***
- ***Will enable you to know what data you need to collect and SAVE***
- ***Figure out how to go about getting that data (Flow Chart)***

Quizzes (6 – 10 pts):

There will be frequent quizzes to make sure you prepare for each class. Questions can include:

- **Information about the experiment you will be doing**
- **key conceptual material did you learned in the previous lab**
- **interpretation of your data from the previous lab, etc. etc. etc.**

Designed to:

- **keep up with the lecture material**
- **make you actually analyze your data from previous lab in a timely manner instead of in the wee hours of the night before the report is due**
- **make sure you prepare for the experiment you are going to that day (goes hand in hand with the Flow Chart)**

Special Research Project: (see SPR web page)

- ***A guided-inquiry research experience* at end of semester**
- **Based on an experimental observation you will make early in the semester**
- **Choose between a few projects or problems OR you can design your own Project**
- **No lectures, no protocols (except from literature)**
- **Do your own literature research**
- **Design own and carry out own experiments**
- **Make an oral presentation as a group to class (20 pts.)**
- **Incorporate information into final AP manuscript**
- **Results will become the foundational basis for the next semester's project**

Data from the SRP has been incorporated into posters presented at the Experimental Biology meetings in 2010 and 2011.

Oral Presentations (see Syllabus for details):

In addition to normal class room Q&A's:

- 1. *Presentation of analyzed data from previous lab***
- 2. *Presentation of literature material***
- 3. *Special Research Project Presentation (20 pts.)*** (see link on course homepage for description)
 - A short Power Point presentation after completing experiments outlining results
 - Data from this project to be included in your final AP lab report
- 4. *Current or Proposed Research Seminar (50 pts.)*** (15- 20 minutes)
 - End of semester
 - For those already working in a lab, seminar will cover work done to date in that lab
 - For those who have NOT chosen a lab, you must determine in whose lab you would like to do your Sr. Research Thesis work or UBRP project
 - You will provide the name of the PI by the first week in November

Expectations:

- 110% from us.
- 100% from y'all.

Grading: *YOU DO NOT "DESERVE" A GRADE IN THIS CLASS. YOU EARN IT!!!*

- See Syllabus for details:

Lab Reports (~6)	20-30 pts.
Homework (~2)	10- 20 pts
AP Manuscript	100 pts
Pop Quiz (?)	6 - 10 pts each
SPR Presentation	20 pts
Current Research Seminar	50 points

Grades can be checked on D2L!

How can you do well in this course?

1. Begin working on your lab report the day you do the experiment (*we will check to make sure you have analyzed data*)
2. Become intellectually engaged with the material in your lab report; do not simply go through the motions
3. Talk to the instructional staff in class, via emails, or during office hours
4. Ask questions!!!!

Ways to Easily Jeopardize Your Grade!!!!

- Miss class without a VERY good reason:
 - 2 cuts: 1 letter grade decrease.
 - 3 cuts: 2 letter grade decrease.
 - 4 cuts: DROP THE COURSE and switch majors.
- Routinely arrive late to lecture (*walking in 1msec late = 1/2 missed class*)
- LATE OR NO LAB REPORTS
- Think there will be no Pop Quizzes
- Do not prepare before coming to class
- Do not get help when you need it
- Do not engage yourself intellectually when writing your lab report
- Texting, Tweeting, or Sleeping during lecture
- Whining

The choice is yours!!!

In Conclusion, my educational philosophy:



Now, do you REALLY want to be here?

In Koffler 540

Lab Equipment:

- **Let us know immediately if:**
 - something is broken
 - if you break something
- **Handle with care:**
 - this equipment is **EXPENSIVE!**
- **Be Careful with Toxic and/or Dangerous Materials:**

NaOH

Acids

Ethidium Bromide (EtBr)

Acrylamide powder

Broken glass

- **Safety Matters:**
 - Fire Extinguisher in hall, across from elevator.
 - Eye wash in SW corner of lab
 - Telephone in prep room – 911
 - Lab coats optional
- **Safety Glasses: Required. Will be provided.**
- **NO OPEN TOED SHOES, SANDALS, etc.**

If you violate this rule you get to choose between:

- walking on broken glass
- having concentrated HCl dropped on the toes
- wear a very stylish and chic form of foot apparel (Saran Wrap or latex gloves) for the entire class!!!!

- NO mouth pipetting.
- Proper Disposal of:
 - Paper waste
 - Chemicals
 - Glass, pipette tips
 - Cell cultures, gels, etc.
- Computers are to be used for legitimate lab work, not checking your email, checking the news or stock prices.
- Turn off cell phones, no texting, tweeting or whatever on them during class (*I can very easily demonstrate the 2nd Law of Thermodynamics with a rubber mallet*).

Next Class: Please be sure to bring all the necessary equipment and tools (mental and physical).