

CHE-255 – Biochemistry
Course Syllabus
Fall 2012

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Lecture: Nobel 222 MWRF 11:30 am – 12:20 pm

Laboratory: Nobel 207 M 1:30 pm – 5:20 pm
 T 1:30 pm – 5:20 pm
 Th 1:30 pm – 5:20 pm

Office Hours and communication: My scheduled office hours are the following:

Monday 12:30 pm – 1:30 pm
Wednesday 9:00 am – 10:00 am
Thursday 1:30 pm - 2:30 pm

If these times are not convenient, contact me and we will arrange an alternate time to meet. Generally, I will not be available to meet with you in the 30 minutes that immediately precede class. I do answer questions via email, however, my response may not be immediate. I will frequently use email and Moodle to communicate with the class as a whole. Please check both with some frequency (~daily).

Required Materials

Textbook: Lehninger Principles of Biochemistry, Nelson & Cox, 5th Ed., 2008, W.H. Freeman & Co.

Laboratory Manual: CHE-255 – Fall 2012, Lab Manual (available from the Book Mark)

Supplies: Safety glasses or goggles

Laboratory notebook (any type)

On-line Resources

Moodle: The course and lab Moodle pages contain information and handouts for the course.

<http://moodle.gac.edu/>. **Note** that we will not be using the lab moodle pages associated with each lab section (003, 004, and 005). Rather we have created one lab moodle page that all 255 students are enrolled in. Thus, you will be working with two moodle pages for the course, f-che-255-001 and f-che-255-laboratory.

Book Web Site: This site provides you with videos, animations, tutorials, and quizzes to help you explore and understand concepts covered in the book and in class.

<http://www.freeman.com/lehninger5e>

Course Overview

Biochemistry involves the study of biological processes at a molecular level. Building on a foundation of coursework in biology and chemistry, we will explore the structure, function, interactions, and chemical properties of the four major types of biological macromolecules: proteins, nucleic acids, lipids, and carbohydrates. In addition, we will study the principles and details of bioenergetics and metabolism to gain an understanding of the energy flow required for survival of a living organism.

The biochemistry laboratory is a fundamental part of the course, designed to complement the lecture. It will give you some practical experience into biochemical techniques, including protein purification, enzyme kinetics, and electrophoresis. Biochemistry laboratory is not just about performing experiments; laboratory groups will also spend time discussing, preparing for experiments, analyzing results, and designing their own experiment. An introduction to and practice in scientific writing is a major component of the laboratory portion of the course.

Attendance

Attendance and active participation in class lectures is important to your understanding and enjoyment of biochemistry, and is necessary for success in this class. Some examples of active participation include, but are not limited to: answering posed questions, active group work during in-class exercises, asking questions about the material during class, and actively working during lab on biochemistry lab-related items. I expect your attendance at all classes and hold you responsible for all that is handed out, announced, or discussed there. Approximately once a week, you will be asked to complete a 'pre-activity', in preparation and anticipation of a small group in-class activity. Your attendance, active participation, completion of the pre/post-activities will account for 30 points of your final grade in this course. In the event that you become ill, have an emergency, have job or professional school interviews, have a college-sanctioned event etc., please contact me about your absence as soon as possible.

Attendance in laboratory is required for passing the laboratory portion of the course. If you anticipate that you will be absent from your scheduled laboratory due to an extenuating circumstance, you must inform your laboratory instructor of the expected absence prior to the date in order to make alternate arrangements. You will need to complete the scheduled lab on your own time. If an emergency situation or a significant illness arises, please inform me and/or your lab instructor as soon as possible.

Cell phones/pagers/other electronics

As a courtesy to your fellow classmates and instructor, please turn your cell phones, iPods, and any other non-class-related electronic device OFF during scheduled lecture and laboratory time. Use of a prohibited electronic device during class may result in dismissal from that class (at the instructor's discretion). Use of a prohibited electronic device during an exam will result in a grade of 0 on that exam.

Academic Honesty and Honor Code

Every student of Gustavus Adolphus College signs the following statement prior to enrollment and course registration:

'As a community of scholars, the faculty and students of Gustavus Adolphus College have formulated an academic honesty policy and honor code system, which is printed in the Academic Bulletin and in the Gustavus Guide. As a student at Gustavus Adolphus College, I agree to uphold the honor code. This means that I will abide by the academic honesty policy, and abide by decisions of the joint student/faculty Honor Board.'

The following code will be signed on every examination and appropriate written assignments in this course:

'On my honor, I pledge that I have not given, received, nor tolerated others' use of unauthorized aid in completing this work.'

This code places the responsibility for academic honesty exactly where it should be – with the student. As a student of this college, you have promised to uphold the pledge and to abide by it. For my part, I will expect every student to sign the honor code pledge on each exam and graded written assignment that you complete in this course. Any exam or assignment that is turned in without a signed pledge will not be graded until we have a conversation.

In laboratory, you will be performing experiments in collaboration with one or two of your colleagues. However, the writing of short and long laboratory reports should be an **individual** endeavor; it will be an honor code violation to use any part of the narrative components of a laboratory report written by another individual. This, of course, should not prevent your discussing and analyzing your results with your colleagues. It will also be an honor code violation to present the data of another laboratory group as your own without proper acknowledgment and instructor permission.

An integral part of the honor code is non-tolerance of violations. Under our code, students are not expected to police others' actions. Rather, you agree to report violations of which you become aware. Failure to do so will constitute an honor code violation in this class.

Any student found in violation of the academic honesty policy and honor code will receive a grade of 0 for that exam or assignment. The Office of the Provost will be notified of the nature of the offense. A second offense will result in an F for the course. If you have any questions about these policies or if you are unsure of issues regarding academic honesty, please come see me or your lab instructor.

Course Grading

The breakdown of your course grade (by points) is as follows:

| | |
|--|------------|
| Primary literature discussion and worksheet..... | 15 |
| Explorations in Protein Structure (1 x 10 pts, 1 x 20 pts)..... | 30 |
| Exams (3 x 100 pts)..... | 300 |
| Comprehensive Final Exam..... | 100 |
| Short laboratory report | 40 |
| Data Analysis and Questions (DAQ) (3 x 20 pts, 1 x 10 pts)..... | 70 |
| Experimental Design Proposal..... | 25 |
| Experimental Execution..... | 10 |
| Long Report (manuscript-style)..... | 100 |
| Peer Response and response evaluation (2 x 20 pt)..... | 40 |
| Experimental Design Presentation..... | 40 |
| Laboratory Notebook (2 x 20 pts)..... | 40 |
| Laboratory Participation..... | 20 |
| <u>Active participation, attendance, and pre/post-activity completion...30</u> | |
| | 860 points |

The **approximate** grading scale in this course will be: 93-100% A; 90-92% A-; 88-89% B+; 83-87% B; 80-82% B-; 78-79% C+; 73-77% C; 70-72% C-; 68-69% D+; 63-67% D. The scale listed is guaranteed (*i.e.* if you average an 86% in the course (lecture and laboratory), you are guaranteed at least a B for the course). If circumstances force me to lower the grading scale a student who averages an 86%, may achieve a B+. However, I will not raise the grading scale (*i.e.* the student who averages an 86% will never receive a B-).

I will try to post all grades on the course Moodle page to allow you to track your progress in this course.

Course Grading Components

- **Primary literature discussion and report:** We will read a journal article from the primary literature related to a biochemical topic. While reading, you will answer a series of questions about the paper. You will spend some time in lab groups discussing the content of the paper, in an effort to summarize and evaluate the paper in terms of its scientific merit, format and writing style. This exercise will be used to model the type of approach that I hope to see you use as you complete work relating to the scientific literature and scientific writing.
- **Explorations in Protein Structure:** You will use a web-based three-dimensional protein structure tool to explore the structures of proteins and capture a graphical images of your molecules. You will record your observations and share additional information about the proteins that you explore.
- **Exams and Final:** Exams will consist of a variety of short-answer and essay type questions that test your understanding of the lecture, reading, and laboratory material. In addition to asking you to recall facts and principles, I will ask you integrate and synthesize the material to extend the principles learned to new situations and to offer explanations for phenomena that have not been specifically discussed in class. On every exam, it will be assumed that you are familiar with all material from the beginning of the course, although very little of earlier units will be tested directly until the final.
- **Laboratory reports:** As a tool for discussion and practice in scientific writing, you will write two formal short reports that describe materials and methods (exp 1 & 2) and results (exp 2). You will receive feedback on the first short report, but will not receive any points for completion of the assignment. You will receive both feedback and a grade on short report (SR 2). A formal initial and final draft of a full manuscript-style laboratory report will be written for experiment 3, which will include a peer feedback/response process.
- **Data analysis and questions (DAQs):** For experiments 1, 2, 3 (week 1), and 4, you will complete and turn in experimental results, analysis of those results, and/or answers to provided questions, as described within each experiment. This assignment will give you practice in thoughtful data analysis, presentation of raw data and analyzed results, and modeling a narrative discussion about experimental data.

- **Experimental design proposal, planning, execution, interpretation, and presentation:** Based on the knowledge gained from the purification, pH and kinetic characterization, and literature of fumarase, you and your lab group will design an experiment for further study with the enzyme. Your group will draft an experimental proposal for the experiment based on at least one literature reference with a clear purpose, hypothesis, and experimental plan. Your group will set up a timeline and prepare all solutions and equipment necessary to complete your proposed experiment. After completing the experiment and interpreting the results, your group will make an oral presentation to the class about your work.
- **Peer response:** You will respond and constructively comment on the initial draft of the full laboratory report of two classmates and evaluate the responses that you received from your peers.
- **Laboratory notebooks:** Because *your* observations are of great importance during the course of an experiment, you will keep a laboratory notebook of what you do and what occurs in lab during an experiment. Lab notebooks will be collected twice during the semester for evaluation. If results discussed in laboratory reports are not supported by observations recorded in the notebook, scores on lab reports will be reduced. The content of the notebook is discussed in the lab manual and will be discussed further during the first pre-lab lecture.
- **Lab participation/group work component:** We perform laboratory experiments in CHE-255 as lab groups of two or three persons. Although the experimental work performed is a group effort, each group member is responsible for ALL aspects of the lab (*i.e.* even if it was not your 'job' to do the stock dilutions). During each laboratory meeting, your instructor will monitor your participation in the scheduled laboratory experiment/activity and award a maximum of 20 points for the semester based on your contributions. The members of your laboratory group will also have a chance to evaluate your contributions through an evaluation form. **Cleaning up the lab bench/solutions prep area/cold box is part of being part of a team and will be included within this grade.**
- **Class attendance, active participation, and completion of pre/post-activity assignments:** Please see the attendance and active participation policies for the course, as described earlier within this syllabus. In class this semester, you will be participating in a variety of group-based activities to help you learn and engage in the subject of biochemistry. You will be asked to complete a pre-activity prior to the group work, so that your time in class is productive and beneficial for all of the members of your group. Your completion of the pre/post-activities, as well as your contributions to the efforts of your group will be a component of this portion of your class grade.

Assignment submission

For non-exam, graded lecture and laboratory assignments, we will require Moodle submission on either the course Moodle page (lecture) or laboratory Moodle page (lab). If you prefer to read comments on a paper version of an assignment (even though all assignments require Moodle submission), you may submit an assignment in paper form and we will make comments on the paper version. Assignment due dates will be stated in class verbally, written on any handout associated with a particular assignment (if there is one), are present within the tentative schedule associated with this course syllabus, and are present in the lab manual (lab assignments).

Late assignment/exam date change policies

All lecture assignments (unless otherwise noted) are due on the given date at 5:00 pm. All laboratory assignments are due on the given date by 1:30 pm, unless otherwise noted. Assignments need to be uploaded onto Moodle by the due date/time. I expect you to turn in your assignments and take your exams on the scheduled day. I like to grade assignments and exams as a large group, so that the assignments are graded with the same frame of reference. If extenuating circumstances will not allow you to turn in an assignment or take an exam at the given day/time, you need to contact me or your lab instructor as soon as possible to request an extension. The appropriate instructor will consider extensions on a case-by-case basis. Approval will depend upon the assignment, rationale for the extension, and timing of the request. If an extension is not approved or is not requested, your final score on any late assignment or exam will be deducted by 10% for each 24 hour period after the due date/time (*i.e.* a 30 point assignment due on Sept 23 at 5:00 pm will automatically be docked by 3 points if turned in between 5:01 pm on Sept 23 and 5:00 pm on Sept 24).

Notably, late assignment/extensions will not be allowed for the first draft of the long report because of the importance of an on-time submission to all other members of the class. If this first draft is not submitted (electronically) on time and in a complete format, you will not receive the benefit of two peer responses on your draft and you will not have the opportunity to respond to two peers' drafts. Our final exam is scheduled on Tuesday, Dec 18th. I will offer at least one alternate time/day for the final exam, thus requests for rescheduling the final exam are typically not necessary.

Course Expectations

CHE-255 is a challenging course and it is not unusual to experience difficulty. Nevertheless, I am confident that you can do well, especially if you follow the suggestions below.

Keep current.

It is very important that you keep up with the course material as it progresses. Keeping current will make the class much more understandable and enjoyable. You will be able to ask questions and make the class work for you. Keeping up with the course means reading the appropriate textbook chapter section, attending class, being prepared for class, reviewing notes immediately following class, checking email and/or Moodle regularly, and seeking clarification of the material as soon as possible.

Regular attendance and active participation in class is helpful to you, to me, and to your fellow students. It helps you clarify any difficulties you encounter. At times, the course lecture and questions asked by your peers will point out and solve a weakness of which you were not aware. Your questions in class help me to know where you are encountering difficulties. If no one says anything in class, how am I to know if I am lecturing too quickly or incorrectly assuming that you recall some facts from your 'core' coursework in the biology and chemistry departments? Your attendance and questions will help your fellow students in much the same way they help you. Your insights may be precisely what they need to help them understand.

For many of my course lectures, I will post a series of power point slides on the course Moodle page prior to the lecture. For some students, taking notes on the slides is very beneficial to help him/her learn the materials. If this will help you, feel free to access these pages prior to or following lecture. NOTE: These slides may not be available until 11 am on the morning of the lecture.

Prepare for the prelab lecture.

Because laboratory is an integral part of the course, we will usually have a prelab discussion during a lecture period prior to each laboratory experiment. It will be beneficial to prepare for the prelab lecture by reading and thinking about the experiment that is to be discussed. This preparation will allow you to more thoroughly understand experimental details that are being discussed or demonstrated. Biochemistry laboratory is a challenging and sometimes frustrating experience. If you can take advantage of the prelab lecture by asking specific questions about the procedure and tasks that are to be completed during the actual lab, you will likely have a more positive and successful laboratory experience.

Prepare for the in-class activities.

Approximately once a week, our time in class will consist of group work that relates to the current class topic. These in-class activities will assume that you have completed the pre-activity. Previous students will attest, without preparation, the in-class activities will not be as worthwhile to your learning of the subject.

Enjoy learning biochemistry.

Many students have found this course challenging, but enjoyable. They have made the course fun by helping each other, working in lab groups, and studying together outside of class. After you've read your text, reviewed your notes, get together weekly with your friends--ask each other questions, explain concepts to one another, challenge each other.

Ask Questions.

Addressing difficulties immediately is especially important due to the pace and number of topics we cover in this course. My office hours are listed on the first page. If these times are not convenient, contact me and we

will arrange an alternate time to meet. I am in my office frequently and would be happy to help you at anytime that I am available.

Services

Disability Services

Gustavus is committed to ensuring the full participation of all students in its programs. If you have a documented disability (or you think you may have a disability of any nature) and, as a result, need reasonable academic accommodation to participate in class, take exams, or benefit from the College's services, then you should speak with the Disability Services Coordinator, Laurie Bickett (lbickett@gustavus.edu or x6286) for a confidential discussion of your needs. Course requirements cannot be waived, but reasonable accommodations may be provided based on disability documentation and course outcomes. Accommodations cannot be made retroactively; therefore, to maximize your academic success at Gustavus, please contact Disability Services as early as possible. The office is location in the Advising and Counseling Center.

Help for Students Whose First Language is not English

Support for English Language Learners (ELL) and Multilingual students is available via the College's ELL Support staff person, Andrew Grace (agrace@gustavus.edu or x7395). He can meet individually with students to consult about academic tasks and to help students seek other means of support. In addition, ELL and multilingual students can seek help from peer tutors in the Writing Center.

Tentative Schedule

Below is the tentative schedule for the semester. Note that the schedule is tentative, if we need to spend more time on a particular lecture subject, I will adjust the calendar appropriately. Due dates for assignments and exams dates are shown in bold. The laboratory schedule and associated pre-lab lecture are shown in italics and bolded italics for assignments.

| Mon | Wed | Thurs | Fri |
|---|---|---|--|
| | Sept 5 Intro and Ch. 1 | Sept 6 In-class activity | Sept 7 <i>Prelab-exp 1</i> |
| Sept 10 Ch. 1/2 <i>Lab—exp 1 (M,T,Th)</i> | Sept 12 Ch. 2 | Sept 13 In class activity | Sept 14 <i>Prelab-exp 2</i> |
| Sept 17 Ch. 2/3 SR1 and DAQ1 due (M,T,Th) <i>Lab—exp 2 (M,T,Th)</i> | Sept 19 Ch. 3—In class activity | Sept 20 Ch. 3 | Sept 21 Ch. 3 |
| Sept 24 Ch. 4 <i>Lab—1^o lit disc and pH prob (M,T,Th)</i> | Sept 26 Ch. 4 | Sept 27 In class activity | Sept 28 Ch. 4 |
| Oct 1 Exam 1 <i>Lab—none (M,T,Th)</i> | Oct 3 No class-Nobel conference | Oct 4 Ch. 5 | Oct 5 <i>Prelab—exp 3, week 1</i> |
| Oct 8 Ch. 5 <i>Lab—Exp 3, week 1 (M,T,Th)</i> SR2 and DAQ2 due (M,T,Th) | Oct 10 Ch. 5 | Oct 11 In class activity | Oct 12 <i>Prelab—exp 3, week 2</i> Protein structure I due |
| Oct 15 Ch. 6 <i>Lab—exp 3, week 2 (M,T,Th)</i> DAQ 3 due (M,T,Th) | Oct 17 Ch. 6 | Oct 18 In class activity | Oct 19 Ch. 6 |
| Oct 22 No class—reading break <i>No lab on M,T</i> | Oct 24 Ch. 6 | Oct 25 <i>Prelab—exp 3, week 3</i> <i>Lab—exp 3, week 3 (Th)</i> Lab nbks due (all lab sects) | Oct 26 Ch. 6 Protein structure II due |
| Oct 29 Ch. 6/7 <i>Lab—exp 3, week 3 (M,T)</i> | Oct 31 Exam 2 | Nov 1 <i>Prelab—exp 4</i> <i>Lab—exp 4 (Th)</i> DAQ 4 due (Th) | Nov 2 In class activity |
| Nov 5 Ch. 7 <i>Lab—exp 4 (M,T)</i> DAQ 4 due (M,T) | Nov 7 Ch. 7 Initial draft of long report due (all labs) | Nov 8 <i>Prelab—experimental design</i> <i>Lab—experimental design-wk 1</i> 1st draft exp proposal due (Th) | Nov 9 In class activity |
| Nov 12 Ch. 8 <i>Lab—experimental design-wk 1 (M,T)</i> 1st draft of exp proposal due (M,T) | Nov 14 Ch. 8 Peer response due | Nov 15 Ch. 10/11 <i>Lab—experimental design-wk 2</i> Final exp proposal due (Th) | Nov 16 In class activity |
| Nov 19 The Biochemistry of Thanksgiving <i>Lab—experimental design-wk 2 (M,T)</i> Final exp proposal due (M,T) | Nov 21-23 No class—Thanksgiving break | | |
| Nov 26 Ch. 10/11 <i>Lab—experimental design-wk 3 (M,T,Th)</i> | Nov 28 Ch. 10/11 Final long report and peer response evals due (all labs) | Nov 29 Ch. 13 | Nov 30 In class activity |
| Dec 3 Ch. 14 & 15 <i>Lab—experimental design-wk 4 (M,T,Th)</i> | Dec 5 Exam 3 | Dec 6 Chap 14 & 15 | Dec 7 In class activity |
| Dec 10 Ch. 16 Lab—exp design presentations, notebooks, and evals due (M,T,Th) | Dec 12 In class activity | Dec 13 Ch. 18 | Dec 14 Ch. 18 |
| Tuesday, Dec 18 Final exam—10:30-12:30 | | | |

CHE-255 Laboratory Schedule and Due Dates:

| <u>Dates:</u> | <u>Experiment</u> |
|---------------------|---|
| 9/10, 9/11, 9/13 | Expt 1: Introduction to basic techniques—Protein concentration assays |
| 9/17, 9/18, 9/20 | Expt 2: pH dependence of fumarase <i>Short report 1 (for feedback) and DAQ 1 due</i> |
| 9/24, 9/25, 9/27 | Discussion on scientific writing, pH & pK _a Exercises <i>Be prepared for a discussion about the posted literature</i> |
| 10/1, 10/2, 10/4 | NO LAB-Nobel Conference |
| 10/8, 10/9, 10/11 | Expt 3: Purification of yeast fumarase <i>Short report 2 and DAQ 2 due</i> |
| 10/15, 10/16, 10/18 | Expt 3: Purification of yeast fumarase (con't) <i>DAQ 3 due</i> |
| 10/22, 10/23 | NO LAB – Fall Break |
| 10/25, 10/29, 10/30 | Expt 3: Purification of yeast fumarase (cont'd) <i>Midterm Lab notebooks due for all students at 5:20pm on 10/25</i> |
| 11/1, 11/5, 11/6 | Expt 4: Kinetic analysis of fumarase <i>DAQ 4 due at 5:20 pm (end of lab)</i> |
| 11/7 | <i>Initial draft of long report due at 11:30am (beginning of lecture)</i> |
| 11/8, 11/12, 11/13 | Fumarase experiment - design <i>First draft of experimental design proposal due at 5:20pm (end of lab)</i> |
| 11/14 | <i>Peer responses due at 11:30 (beginning of lecture)</i> |
| 11/15, 11/19, 11/20 | Fumarase experiment – design/prep <i>Final draft of experimental design proposals due at 5:20pm (end of lab)</i> |
| | <i>(Reminder: Thanksgiving Break 11/21-11/25)</i> |
| 11/26, 11/27, 11/29 | Fumarase experiment – prep/execution |
| 11/28 | <i>Final draft of long report and evaluations due at 11:30 (beg of lecture)</i> |
| 12/3, 12/4, 12/6 | Fumarase experiment – exec/interpretation |
| 12/10, 12/11, 12/13 | <i>Fumarase experiment - presentations</i> <i>Lab notebooks due, peer evaluations due (end of lab)</i> |