

CHE-255 – Biochemistry – Spring 2012

Dr. Heather Haemig

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Lecture: Nobel 305 MTWF 12:30 pm – 1:20 pm

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

Office Hours and communication:

My scheduled office hours are the following: **Tues 9:00 am – 10:00 am, Wed 2:00 pm - 3:00 pm and Fri 2:30 – 3:00 pm**

I am available to meet at other times by appointment. Contact me to arrange an alternative time. Generally, I am not available between 12:00pm and the start of class. I will also answer questions via email but you should allow 12 hrs for a response during the week and 24 hrs on a weekend. In other words, don't email a critical question 45 minutes before an assignment is due! I will email the class periodically with announcements regarding lecture and lab. It is your responsibility to check your email daily. You are welcome to use the course alias s-CHE-255-001@gustavus.edu to ask relevant questions of the class/lab.

Required Materials

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

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

Supplies: Safety goggles

Laboratory notebook (any type)

On-line Resources

Moodle: The course Moodle page contains information and handouts for the course.

<http://moodle.gac.edu/>

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

Your attendance and active participation in both class and laboratory are essential to your success in this class. Coming to class and laboratory sessions prepared to be fully engaged in the material will enhance your understanding of biochemistry and also make the semester more interesting.

Some examples of active participation include, but are not limited to: answering posed questions, discussing biochemistry during in-class exercises, asking questions about the material during class, paying close attention in lecture, and actively working during lab on biochemistry lab-related items.

Although attendance is not formally recorded in lecture, I expect your attendance at all classes and hold you responsible for all that is handed out, announced, or discussed there. At various times throughout the semester, I will assign some work to complete before class. Your attendance, active participation, and preparation for in-class 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, 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 as soon as possible. Lab space is particularly tight on Tuesday and it will be difficult for Monday students to just make up lab on Tuesday. Even if you are ill, please contact me in the morning of lab so we can discuss an alternative plan.

Cell phones/iPods/other electronics

As a courtesy to your fellow classmates and instructor, please keep all electronic devices such as phones, iPods, etc. off during lecture and laboratory time. Use of a prohibited electronic device may result in dismissal from lecture or laboratory. Any cell phone use during lab may affect your laboratory participation points if it becomes a recurring circumstance and hindrance to your lab group and/or our ability to convey important information during laboratory.

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 laboratory written assignments:

'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 written assignment that you complete in this course for a grade. 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 plagiarism or paraphrasing in particular (since this is the area where these issues often arise), please come see me BEFORE you turn something in. PLEASE!!!

Course Grading

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

<i>Primary literature discussion (LAB)</i>	20
<i>Response papers (2 x 10 pts)</i>	20
<i>Research article summary</i>	30
<i>Exams (3 x 100 pts)</i>	300
<i>Comprehensive Final Exam</i>	100
<i>Current Topics in Biochemistry Presentation & Report</i>	20
<i>Short laboratory reports (2x 20 pts) (LAB)</i>	40
<i>Data Analysis and Questions (DAO) (4 x 10 pts) (LAB)</i>	40
<i>Experimental Design Proposal (LAB)</i>	25
<i>Experimental Execution (LAB)</i>	10
<i>Long Report (manuscript-style) (LAB)</i>	100
<i>Peer Response and response evaluation (2 x 20 pt) (LAB)</i>	40
<i>Response Letter (LAB)</i>	10
<i>Experimental Design Presentation (LAB)</i>	40
<i>Laboratory Notebook (2 x 20 pts) (LAB)</i>	40
<i>Laboratory Participation (LAB)</i>	20
<i>Active participation, attendance, and pre-activity completion</i>	30
<i>Biochemistry on the WWW</i>	30
Total Course points	915 pts

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 lecture and lab Moodle pages to allow you to track your progress in this course.

Course Grading Components

- Primary literature discussion:** 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. We will spend some time in lab discussing the content of the paper and your responses to the questions, in an effort to summarize and evaluate the paper in terms of its scientific merit. We will also discuss some features of the format and writing style of the paper, in preparation for the writing of your short and long laboratory reports. This exercise will be used to model the type of approach that I hope to see you use as you complete future assignments relating to the scientific literature and scientific writing.
- Biochemistry on the WWW:** You will use class time on 2/20 to explore biochemistry resources on the internet that aid in your visualization and/or understanding of proteins, DNA, metabolic pathways. You are expected to write a short synopsis of the interesting tools you found on the web.
- Response papers:** We have great privilege to have a weekly seminar series in the Chemistry department. This assignment requires you to attend/view two of them (preferably the biochemistry-leaning ones) and write a 2 page summary on the talks. If you cannot attend Chemistry Seminar due to a course conflict, you may read some of the speaker's published work and write a 2 page summary.
- Research article summary:** You and your partner/s will use an appropriate scientific database (*i.e.* Medline, SciFinder Scholar, Web of Science, etc.) to identify and obtain a copy of a research article on fumarate hydratase, the enzyme that we will study in laboratory this semester. The members of your group will read and write a two-page summary of the article.
- 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 to 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.
- Current Topics in Biochemistry:** Working in a small group, you will be introduced to a biochemistry-related problem through a magazine or newspaper article. Your group will be responsible for becoming familiar with the science behind the problem, some of the techniques/methods to identify and study the problem, and how/why the problem is relevant. You will write a summary of your findings and give a short report to the class (7 minute report + 3 minutes for questions).
- Laboratory reports:** As a tool for discussion and practice in scientific writing, you will write two formal short reports that describe the methods and results of experiments 1 and 2 and receive significant instructor feedback. A formal initial and final draft of a full manuscript-style laboratory report will be written for experiment 3, which will allow for significant peer feedback as well as opportunity for instructor feedback.
- 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. Execution points will also be assigned according to how well you worked together to carry out your experiment.
- Peer response and response letter:** You will respond and constructively comment on the initial draft of the full laboratory report of two classmates. As part of the final draft of YOUR report, you will construct and submit a one-page letter within which you will specifically and briefly respond to the concerns set forth by your peer reviewer/s.
- 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 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 grade your contributions through an evaluation form. **Cleaning up the lab bench/solutions prep area/cold box EACH WEEK is part of being part of a team and will be included within this grade.**
- Class attendance, active participation, and completion of pre-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-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 some lecture or laboratory assignments, you will have the option to submit your assignment electronically on the course Moodle page (lecture), the laboratory Moodle page (lab assignments) or turn in a paper copy. For other assignments, we will require Moodle submission (*e.g. laboratory reports, literature summary*). Assignment submission details will be stated in class verbally and written on any handout associated with a particular assignment (if there is one).

Late assignment/ exam date change policies

All lecture assignments (unless otherwise noted) are due on the given date at the start of class (12:30 pm). All laboratory assignments are due on the given date by 1:30 pm, unless otherwise noted.

Assignments may be handed directly to me or placed under my office door (if paper) or 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. However, I am aware that you all have many academic and personal commitments that go beyond this course. For this reason, you may choose to delay ONE assignment due date or scheduled exam date (not both) by up to 48 hours without penalty. In order to take advantage of this option, you must inform me at least 24 hours in advance of the scheduled 'date', unless there is a serious extenuating circumstance that prevents you from doing so. Email is a perfectly acceptable means of communicating that you need to extend a deadline. As an example, if an assignment is due on February 21 at 12:30 pm, you must inform me by 12:30 pm on February 20 and you must submit the assignment by 12:30 pm on February 23. Each student will only receive ONE opportunity to take advantage of this option unless there is a serious extenuating circumstance associated with your situation. For unapproved late assignments, your final score on the assignment will be deducted by 10% for each 24 hour period after the due date/time (*i.e.* a 30 point assignment turned in from 11:31 am on the due date to 11:30 am on the day after will be docked 3 points). Missed exams (without prior notice) may result in a grade of zero.

NOTE: This extension cannot be used for two assignments.

#1: The initial draft of the long report. It cannot be used for the initial draft 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 (an automatic loss of 40pts).

#2: The final exam (for obvious reasons). The majority of you are seniors. Please see me ASAP once you have looked at your finals schedule if you have more than 2 exams scheduled on one day. I have to have your grades in on Wednesday 5/23!

Course Expectations

Che-255 can be challenging but following these tips will aide in reducing stress/difficulty.

Stay on top of the readings and lectures. Keeping up with everyone will make the class more enjoyable and less work before an exam (but you all know that by now, right?). Tips for staying current include: reading the appropriate part of the text before lecture, come to lecture, review your notes daily, check email and Moodle for updates/clarifications, and ask questions as soon as possible.

Regular attendance is important as well as actively participating in class. 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.

You may also find it helpful to review and perhaps recopy your notes from each lecture before you attend the next one, and to reread text sections. As we move fairly quickly through material in this course, this may help you detect difficulties early enough to prevent any snowballing. More importantly, it will help make the lectures more useful and understandable. The 15-30 minutes you spend reviewing or recopying your notes may save you hours at exam time. As you

review/recopy the notes, think about the material, do not just copy blindly. Ask yourself if the material makes sense.

For most 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 and print off these pages prior to or following lecture. NOTE: These slides may not be available until 12pm on the morning of the lecture. If course attendance becomes an issue, these slides may be made available in the form of handouts only to those at class.

Prepare for the prelab lecture. Because laboratory is an integral part of the course, we will usually have a prelab discussion during the Monday lecture period each week. It would be to your benefit to prepare for the 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. Because lab follows class, I will make very few announcements at the start of laboratory.

Have fun with biochemistry and your classmates by studying together, working together, and talking to each other about biochemistry!

Ask Questions. Addressing difficulties immediately is especially important in this course due to the pace and number of topics we cover in this course. My office hours are listed on the first page and I guarantee I will be available in my office during these times. If these times are not convenient, contact me and we will arrange an alternate time to meet. I may add additional office hours or revise the times as needed based upon student availability.

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.

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. However, if we need to spend more time on a particular lecture subject, I will adjust the calendar appropriately. I will post any revised calendars on Moodle.

Mon	Tues	Wed	Fri
Feb 6 Intro and Pre-lab Exp 1 <i>Lab - Exp 1 (M,T)</i>	Feb 7 Ch.1	Feb 8 Ch.1	Feb 10 Ch.2 Chem Sem
Feb 13 Pre-lab Exp 2 <i>Lab – Exp 2 (M,T)</i> SR1/DAQ1 due	Feb 14 Ch. 2	Feb 15 Ch. 2	Feb 17 Ch.3
Feb 20 No class today only No lab <i>Biochem WWW due in class</i>	Feb 21 Ch. 3 No lab <i>Biochem WWW due in class</i>	Feb 22 Ch.3	Feb 24 Ch.3/Ch.4
Feb 27 Ch.4 <i>Lab - 1° Literature Disc and pH probs (M,T)</i> Read papers for discussion	Feb 28 Ch.4	Feb 29 Ch.4	March 2 Exam 1 (Ch. 1-4) Chem Sem
March 5 Pre-lab Exp 3, week 1 <i>Lab – Exp 3, week 1 (M,T)</i> SR2/DAQ2 due	March 6 Ch.5	March 7 Ch.5	March 9 Ch.5
March 12 Pre-lab Exp 3, week2 <i>Lab – Exp 3, week 2 (M,T)</i> DAQ3 due	March 13 Ch.5/Ch.6	March 14 Ch.6	March 16 Ch.6
March 19 Pre-lab Exp 3, week3 <i>Lab – Exp 3, week 3 (M,T)</i>	March 20 Ch.6	March 21 Ch.6	March 23 Ch.6 Lit. Summary Due
March 26 Pre-lab Exp 4 <i>Lab – Exp 4 (M,T)</i>	March 27 Ch.6	March 28 Ch.7?	March 30 Exam 2 (Ch.5&6)
Apr 2 Spring Break	Apr 3 Spring Break	Apr 4 Spring Break	Apr 6 Spring Break
Apr 9 Spring Break	Apr 10 Ch.7 <i>No lab today</i>	Apr 11 Ch.7/Ch.8 Notebooks due Draft of long report due @12:30pm	Apr 13 Pre-lab Exp Design Chem Sem
Apr 16 Discussion – Current Topics in Biochemistry <i>Lab – Experimental Design (M,T)</i> DAQ4 due Initial Exp Design draft due @5:20p	Apr 17 Ch.8	Apr 18 Ch. 10 Peer Reviews due @12:30pm	Apr 20 Ch.10
Apr 23 Current Topics Reports/Summaries <i>Lab – Experimental Design (M,T)</i>	Apr 24 Current Topics Reports/Summaries	Apr 25 Ch. 10/Ch.11	Apr 27 Ch. 10/Ch.11
Apr 30 Ch. 12 <i>Lab – Experimental Design (M,T)</i> Final Exp Design due by 1:30pm	May 1 Ch.12	May 2 (shortened class) Ch.14/Ch.15 <i>Long report due @12:30pm</i>	May 4 Ch.14/Ch.15
May 7 Exam 3 <i>Lab – Experimental Design (M,T)</i>	May 8 Ch. 16	May 9 Ch. 16/Ch.18	May 11 Ch.18
May 14 TBD <i>Lab – Exp Design Presentations, notebooks, evals due (M,T)</i>	May 15 TBD	May 16 TBD	
May 21 Cumulative Final Exam (8-10am)			