

**CHE-360: Proteins**  
**Spring 2012**  
**Gustavus Adolphus College**

Dr. Brenda Kelly  
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Moodle: [www.moodle.gac.edu](http://www.moodle.gac.edu) (course 2012-s-che-360-001)

**Textbook & Supplies:** Safety glasses & group laboratory notebook

**Optional textbook:** Lehninger Principles of Biochemistry, Nelson & Cox, 4th Ed. or 5<sup>th</sup> Ed, 2005/2008, Freeman, NY, NY  
Proteins: Structure and Function, Whitford, 2005, Wiley, England.

**Class Meetings:** Beck 115 MWRF 11:30 am-12:20 pm  
Nobel 207 R 1:30 pm – 5:20 pm

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

Monday 1:30-2:30 pm  
Tuesday 10:30-11:30 am  
Wednesday 8:00-9:00 am

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).

### **Course Overview**

Biochemists study the structure, function, interactions, synthesis, degradation, cellular localization, and reactivity of a variety of biomolecules that are found in living systems, including proteins, carbohydrates, nucleic acids, and lipids. As it is not possible to study all aspects of all biomolecules in a single course, here, we will focus principally on the subject of proteins. In this course, I hope to build upon and extend the basic knowledge of proteins that you acquired in CHE-255, provide you with an integrated, current, and detailed view of the field of protein biochemistry and give you the opportunity to gain a deeper understanding of the importance and role of proteins in living systems.

### **Course Objectives and Expectations**

- To gain an enhanced understanding of and appreciation for protein biomolecules in living systems
- To enhance your skills in scientific literacy, including reading, comprehension, and critical evaluation of scientific information and data
- To develop skill in working independently and collaboratively to achieve progress toward a defined experimental goal
- To increase your proficiency in communicating scientific ideas both orally and in written formats
- To apply your scientific knowledge, your skills in scientific literacy and communication to develop an experimental idea, hypothesis, and plan in its entirety

The lectures, activities, assignments, and laboratory are aimed to provide you with the opportunity to achieve each of the five course objectives. During the semester, we will cover (through class lecture and discussion) five advanced topics related to the subject of proteins. Two resources for these classroom activities will be Whitford's 'Proteins: Structure and Function' and 'Lehninger Principles of Biochemistry' by Nelson and Fox; I will also be using supplementary material from other texts and articles that may also assist to enhance your understanding of a subject. Some of these texts will be available for checkout from the reference desk at the library and I will include appropriate materials on the course Moodle page. Five times during the semester, we will use class time for a Journal Club in which you (as part of a small group) will have the opportunity to present and discuss a manuscript from the primary literature that is related to the current course topic. Periodically, our class time will focus on the major written assignment for this course, the research proposal. On Thursdays, we will utilize our scheduled 'classroom' time as part of the laboratory. This 'extra' laboratory time may be used for planning, preparation, execution, and analysis of experiments, but will also provide time for discussion with faculty and reporting out on the progress of your research project (see below).

We will use our scheduled laboratory time to engage in hands-on, investigative projects that are aimed toward presentation (*i.e.* an end-of-semester poster presentation). If you recall the laboratory projects from Biochemistry, you can think about Proteins laboratory as a semester-long, student group-driven, investigative laboratory project. As you can imagine, this will be fun and challenging and will help to cultivate both independence and teamwork through experimental biochemical research. The success of your group and project will depend heavily upon careful preparation and planning, thus, will likely require some time outside of scheduled laboratory. To foster communication among the group members and to cultivate the skills necessary to achieve your experimental goal, we will have research group meetings during most weeks (on Thursday at 11:30) to report out, trouble shoot, and gain help from the rest of the class. The schedule of the class research group meetings and presenters will be posted during the 2<sup>nd</sup> or 3<sup>rd</sup> week of lab. In addition, your group will have time to meet with me to talk through experiments and your plans during the lab period or at another scheduled time.

I expect that you will find CHE-360 to be a challenging and rigorous course. We will cover complex material in a good degree of depth, laboratory will be investigative (thus we will not know the outcome for a particular experiment/set of experiments), and you will be challenged to communicate and comprehend complex and technically advanced material from the literature. I am, however, confident that all of you have the ability to do well and excel in this course. If you are experiencing difficulty, please see me as soon as possible.

### **Attendance**

I encourage and expect that you will attend, prepare for, and participate in all scheduled course activities and meetings to provide every opportunity to achieve the course objectives. This includes reading or reviewing relevant material, preparing questions, completing the assignments, identifying points for clarification, or noting ideas for discussion. These components of your work (both attendance and active participation) will be evaluated as part of the participation component of your grade. If you anticipate a valid reason for being absent, please tell me as soon as possible. Should you miss a class, you are responsible for understanding and obtaining any materials from class, discussions, laboratory meetings, etc.

Attendance and active participation in laboratory is **required** for passing the course. Depending on your laboratory project, in some cases, some of your time in laboratory may not occur during the hours 'scheduled' for laboratory. This is perfectly acceptable and often necessary. I do, however, expect that you will still attend the scheduled class and group meetings on Thursday to hear about the progress and plans of other groups and to plan for future experiments within your own group. In addition, I expect you to keep track of your laboratory work in your notebook (no matter the time that the work is performed) and the hours of work on the project for each group member. If it appears that you are not working on your laboratory project for an acceptable or necessary period of time, you will likely not pass this course. If an emergency situation arises, please inform me as soon as possible.

## Cell phones/pagers

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

## Academic Honesty and Honor Code

Every Gustavus Adolphus College student is required to sign the following statement before 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 should be written in full on major 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 the honor pledge code to be signed on each formal written document (content summaries, research proposal and components, and progress summaries) that you complete in this course. In order to complete your laboratory progress summaries, you will need (and I encourage you) to discuss, analyze results and review the laboratory notebook with those members of your lab group. I also encourage you to discuss material with your peers before writing of the content summaries (just like you would review material with others before an exam). These activities will not be in violation of honor code policy. However, the actual writing of the progress and content summaries should be an individual endeavor. Because of the intensity of formal and informal writing in this course, we will take time to discuss the subject of plagiarism as it pertains to each assignment-type during class time.

An integral part of the honor code is non-tolerance of violations. Under this 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 assignment. In addition, the office of the Provost will be notified of the nature of the offense. Repetition will result in an F for the course. If you have any questions about these policies, please come see me.

## Course Grading

The breakdown of your grade in this course will be as follows:

Three content summaries/oral presentation.....	225
Research proposal-topic identification .....	10
Research proposal annotated bibliography.....	40
Research proposal—background draft.....	100
Research proposal—experimental outline.....	25
Research proposal—complete and final draft.....	100
Journal club activities.....	100
Laboratory notebooks.....	100
Research progress summary--written.....	25
Research progress summary--oral.....	25
Laboratory poster.....	100
Attendance/participation.....	50

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Total 900 points

## Course Grading Components

- **Content Summaries/Oral Presentation:** You will prepare summaries of the content from three of the units of material covered by the recommend readings, classroom lectures, and discussion. Typically, these will be due ~one week after completing a particular topic (see schedule). A handout describing the components and format of the content summary will be posted on Moodle. You must turn in the first content summary. In place of one of the graded content summaries in the latter half of the semester, you may do an oral presentation on a topic related to Proteins in Therapy and Disease (the last unit topic). The requirements for the presentation will be posted on Moodle. These presentations will take place at the time of our scheduled final exam.
- **Research Proposal:** Your major written assignment for the semester will be a comprehensive research proposal on a topic in the biomolecular sciences. We take a systematic approach to the assignment by having workshops/lectures and periodic due dates of the different components of the proposal throughout the semester. At the beginning of the semester, you will be introduced to the area of topic selection. Your topic choice will be due shortly after this introduction. An annotated bibliography of necessary and appropriate references from the primary literature will be due mid-way through the semester. Next, you will turn in the background section and receive recommendations for improvement. You will turn in an experimental outline ~2 weeks before the final due date for the assignment. Then, at the end of the semester you will turn in the entire proposal, including the experimental narrative section and a revised version of the background and bibliography. This assignment will require your use of search tools that may include Medline, SciFinder, Web of Science, the Gustavus library, as well as a larger regional library (through ILL) to identify and obtain the necessary research articles to complete this assignment. You may also find it useful to use bibliographic software, such as Endnote Web or Ref Works. Supplemental material describing the details and information about this topic will be posted on Moodle.
- **Journal Club:** Reading, critically evaluating, and discussing the scientific literature are related and valuable skills. A common activity where you might employ all of these skills is known as a journal club. We will be meeting regularly to critically discuss papers of relevance to the current course topic. Your full participation will require that you prepare in advance for these discussions by reading the papers carefully (and probably repeatedly). In addition, for each meeting, a small group will prepare to be a resource for questions that might arise during the discussion, *i.e.* to serve as resident experts on that paper/subject. The Journal Club is intended to provide you with an opportunity to develop the skills of independent and critical thinking. Evaluation will be based on your participation and the quality of your contributions as an expert group member and as a participant. Supplemental material about this assignment will be posted on Moodle.
- **Laboratory notebooks:** Keeping a careful record of your work is a critical component to laboratory investigation. A hallmark of scientific credibility is reproducibility, and reproducibility is favored by a detailed record of work completed. Your lab project this semester will be investigative, with the aim of obtaining a publishable outcome, so it will be valuable to have a clear record of your work. Because your lab group members will be dependent upon having access to the information present in your laboratory notebook, all notebooks are to be left in the laboratory. Notebooks will be evaluated at various, unannounced points throughout the semester. Notebook records must be dated, pages numbered, and detailed enough for another junior or senior level bio/chem/biochem major to repeat. In addition, your laboratory notebook should contain a time log for each of the members of your group. Please see me if you have questions about the formatting or components of the notebook.
- **Progress summaries (written):** In order to assist you in your project and help you evaluate the state of the laboratory notebook for your group, each member of your laboratory group will prepare a written project progress summary during the semester. As a group, you will compile a schedule for these and share (in a written, electronic document posted on Moodle) this with me. I will expect your group to meet this schedule. Each summary should be done individually, though you must have each member of your group read and acknowledge (by initialing or email confirmation) the draft that will be turned in to me. Supplementary material with details and information will be posted on Moodle.

## Course Grading Components con't

- **Progress summaries/group meeting (oral):** In order to assist you in your project and to keep your peers and me abreast of the accomplishments and challenges within your lab group, each member of your laboratory group will give a short 'group meeting' to the class. This will be a 10-15 minute talk about your work, the focus of which will change throughout the semester. The first talks will likely have a larger background component, while later talks will cover current experiments, results, data analysis, challenges experienced, etc. The talk may be prepared using overheads, powerpoint, the chalkboard, or handouts. Every person in class will present at least one group meeting during the semester.
- **Laboratory poster:** As a laboratory group, you will prepare a poster and present the outcome of your group's laboratory project to the Gustavus community at the Celebration of Creative Inquiry. We will be spending some class and lab time on the subject of how to prepare posters and additional resources will be noted. A supplementary handout describing the evaluation criteria for the presentations will be available on Moodle as the time draws near.
- **Participation:** Participation is one of the most important parts of learning in this course. Your participation in all aspects of the course (lecture, discussions, journal clubs, laboratory projects and assignments) will be assessed by me. However, because much of the class components involve group work, I will also be requesting self- and peer feedback in order to allocate these points. Achieving high marks in lecture and discussion participation means active engagement in the subject matter, both verbal and non-verbal. Some examples of active participation may include asking clarifying questions, responding when I pose a question to the class, actively listening/taking notes, completing the 'mini' assignments that will be given in preparation for the next lecture period. Active participation in journal club means reading and critically evaluating all of the articles (this means reading them more than once), writing questions that go beyond the basic, topical information that can be found easily in the text of the article, responding to the presenters questions, asking questions that get at the heart of the results, conclusions, and analysis of the paper. Active participation in laboratory means putting in appropriate and well-utilized time in the laboratory to lead to an outcome, collaborating with your lab group members in a productive way, equivalent sharing of laboratory tasks among all group members.

## Grading Scale

The approximate grading scale in CHE-360 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. This scale will be used as a **guideline** for final grade assignment.

## Late assignment policy

I expect you to turn in a given lecture/laboratory assignment on or prior to the due date and time. All assignments (unless otherwise noted) are due on the given date by 11:59 pm. If your assignment is turned in late, your final score on the assignment will be deducted by **5% each 24 hour period** after the due date/time. Please speak with me prior to a due date if extenuating circumstances prevent you from turning in an assignment on time.

## Assignment submission

For some assignments, you will have the option to submit your assignment electronically on the course Moodle page or turn in a paper copy. For other assignments, I will require Moodle submission. If you prefer to read comments on a paper version of an assignment (even though an assignment may require Moodle submission), you may submit any assignment in paper form and I will make comments on the paper version. Assignment submission details will be stated in class verbally and written on any handout associated with a particular assignment (if there is one).

## 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](mailto: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 located 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](mailto: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.

## Lecture Coverage and 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. Due dates and/or major assignments are shown in bold and italics.

Mon	Wed	Thurs	Fri
<b>Feb 6</b> Intro to the course <b><i>How to read a scientific paper and journal article assignment</i></b>	<b>Feb 8</b> <b><i>Journal article discussion</i></b>	<b>Feb 9</b> Lab project overview <b><i>Lab project ranking</i></b> <b><i>Research proposal (RP) topic selection exercise</i></b>	<b>Feb 10</b> Review—amino acids and protein structure
<b>Feb 13</b> Review—protein structure	<b>Feb 15</b> Review—protein structure and enzymes	<b>Feb 16</b> Lab—project groundwork <b><i>Group activity and contract</i></b>	<b>Feb 17</b> Enzymes—The proteases <b><i>Research proposal topics due</i></b>
<b>Feb 20</b> Enzymes—The proteases RP-Annotated bibliography overview	<b>Feb 22</b> Enzymes—The proteases Journal club (JC) overview	<b>Feb 23</b> Lab <b><i>Group reports</i></b>	<b>Feb 24</b> Enzymes—inhibitors
<b>Feb 27-</b> Enzymes--kinetics	<b>Feb 29</b> <b><i>JC--Enzymes</i></b>	<b>March 1</b> Lab <b><i>Group reports</i></b>	<b>March 2</b> Enzymes--kinetics
<b>March 5</b> 3-D structure determination Content summary overview	<b>March 7</b> 3-D structure determination <b><i>RP—annotated bibliography due</i></b>	<b>March 8</b> Lab <b><i>Group reports</i></b>	<b>March 9</b> 3-D structure determination
<b>March 12</b> 3-D structure determination RP-background overview	<b>March 14</b> 3-D structure determination <b><i>Enzymes content summary due</i></b>	<b>March 15</b> Lab <b><i>Group reports</i></b>	<b>March 16</b> Mike Joyner. M.D.—grant proposal writing at Mayo
<b>March 19</b> 3-D structure determination	<b>March 21</b> <b><i>JC--3-D structure determination</i></b>	<b>March 22</b> Lab <b><i>Group reports</i></b>	<b>March 23</b> Protein synthesis—transcription

<b>March 26</b> Protein synthesis-- transcription	<b>March 28</b> Protein synthesis-- translation	<b>March 29</b> Lab <b>Group reports</b>	<b>March 30</b> Protein synthesis— translation <b>3-D structure content summary due</b>
<b>No classes April 2-April 9<sup>th</sup></b>			
<b>April 9—NO CLASS</b>	<b>April 11</b> Protein synthesis-- translation	<b>April 12</b> Lab <b>Group reports</b>	<b>April 13</b> Protein synthesis— translation <b>RP—background due</b>
<b>April 16</b> Protein synthesis--translation Experimental outline overview	<b>April 18</b> <b>JC—protein synthesis</b>	<b>April 19</b> Lab—poster preparation <b>Group reports</b>	<b>April 20</b> Post-translational modification
<b>April 23</b> Post-translational modification <b>RP--Experimental outline due</b>	<b>April 25</b> Post-translational modification	<b>April 26</b> Lab—poster preparation <b>Group reports</b>	<b>April 27</b> Post-translational modification <b>Content summary for protein synthesis due</b>
<b>April 30</b> Post-translational modification <b>Poster submission to media services</b>	<b>May 2</b> <b>JC—post-translational modification</b>	<b>May 3</b> Lab	<b>May 4</b> Post-translational modification <b>Poster presentations at the Celebration of Creative Inquiry</b>
<b>May 7</b> Proteins in Therapy and Disease	<b>May 9</b> Proteins in Therapy and Disease	<b>May 10</b> Lab—clean up	<b>May 11</b> Proteins in Therapy and Disease <b>Research proposal due</b>
<b>May 14</b> <b>JC—Proteins in therapy and disease</b>	<b>May 16</b> <b>Student 3 min reports on RPs</b>	<p><b>Content summaries on post-translational modification and Proteins in Therapy and Disease are due by 8:00 am on Saturday 5/19.</b></p> <p><b>Presentations on Proteins in Therapy and disease on Saturday 5/19 from 8:00-10:00am.</b></p> <p><b>The final day/time to turn materials in for the class is Tuesday 5/22 by 12:00 pm. No materials will be accepted or graded after this day and time.</b></p>	