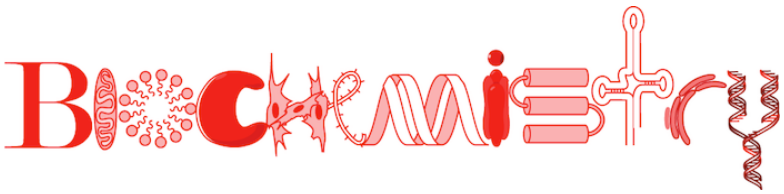
CHM 440



Spring 2016; TR 10:50-12:05; 301 Cox Science & Language

Professor: Dr. Nicholas A. Pullen
Office Hours: **MW** (9-11:30am), **R** (2-5pm), and by appointment
Office Location: Cox Science & Language 205
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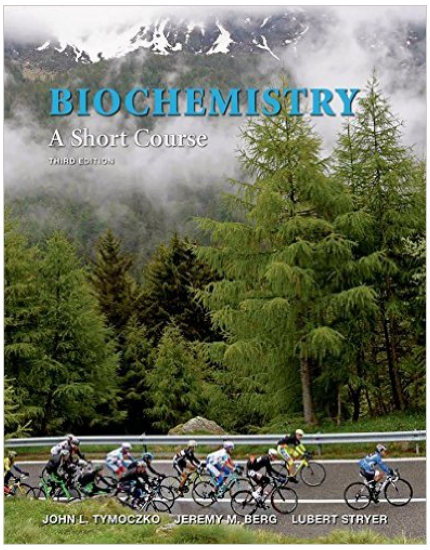
WWU Mission: An independent voice in higher education, William Woods University distinguishes itself as a student-centered and professions-oriented university committed to the values of ethics, self-liberation, and lifelong education of students in the world community.



Course Description: This course addresses the chemistry of living systems, including the structure and function of biological molecules and the mechanisms and products of their reactions. Emphasis will be placed on pathways of energy transfer and signaling, especially those that are deeply conserved among eukaryotes. The major classes of biomolecules will be examined with greatest focus on proteins. Students will actively research modern, primary biochemical literature and interpret it in the context of the principles and pathways discussed in class; furthermore, students will learn how to critique data and methods in the literature. Students will integrate prior knowledge and experiences from general and organic chemistry courses to arrive at a personal, and accurate, explanation of living systems through chemistry. Concurrent enrollment in CHM 441 required.
2015-2016 Academic Catalog: https://www.williamwoods.edu/catalogs/1516/undergraduate/index.aspx

Course Prerequisites: BIO 124 (General Biology II) and CHM 314 (Organic Chemistry I); current enrollment in CHM 441

Required Text: Tymoczko, J. L., Berg, J. M., and Stryer, L. *Biochemistry: A Short Course (3rd ed.)* 2015 W. H. Freeman and Company.

Other Resources: Boyer, R. *Biochemistry Laboratory (2nd ed.)* 2001 Prentice Hall. (not required)
The Journal of Biology Chemistry (http://www.jbc.org/)
PubMed (http://www.ncbi.nlm.nih.gov/pubmed)

Technology Use Expectations: Messages via WWU email are official communication; students are responsible for regularly checking their WWU email accounts. Students are expected to become familiar with basic literature searches using internet databases. Course documents, and grades will be available on the relevant Owlnet page(s). Technology issues should be directed to UIT (ext. 4224; helpdesk@williamwoods.edu).

Course Objectives:
With satisfactory completion of CHM440, students will:

1. Gain knowledge of the major classes of biomolecules.
2. Demonstrate the integration of functions of biomolecules, especially proteins.
3. Gain knowledge of evolutionarily conserved biochemical pathways and mechanisms.
4. Develop comfort and skill with oral and written scientific communication.
5. Appreciate the interdisciplinary nature of biology and chemistry.
6. Learn to find, dissect, and critically evaluate primary biochemical literature.

Biology Program Objectives:

1. Demonstrate knowledge of cell ultra-structure and basic cellular processes and develop an understanding of the requisites of life.
2. Converse with the basic tenets of transmission, molecular, developmental and population genetics.
3. *Contributes to an overview of the major organ systems of the human body and the normal and pathological functioning of those organ systems.*
4. *Demonstrate knowledge of the diversity and taxonomy of organisms, and the significance of variation in morphology, behavior, and life history.*
5. Explain the role that natural selection, genetic drift, and other phenomena have had on the production of biological diversity and the role evolution has in integrating explanations of both the unity and diversity of life.
6. Demonstrate knowledge of scientific methodologies and usage of current scientific equipment and technologies.

This course does not directly address Biology Program Objectives 3 & 4.

Assessment Procedures and Course Assignment Details: Grades are earned through the completion of scheduled unit exams and quizzes, a research paper, and a final exam.

Information addressing all of the above objectives is presented through assigned text & case readings, literature research, PowerPoint presentations, videos, and seminar-style discussions. Formative assessment of student achievement in all objectives is performed via class discussions and quizzes. Summative assessment is performed with unit exams, a comprehensive final exam, and a paper that critically analyzes a piece of primary biochemical literature. *Data pertaining to Biology Program Objective 6 are used for B.A. and B.S. annual Biology Assessment Plans.*

Unit Exams: Taken during scheduled course meeting times. They will be cumulative where necessary. Exams consist of multiple choice, modeling problems, short and long essays, and may cover assigned reading material not directly discussed in class meetings. *Make-up exams are offered only in consideration of extraordinary circumstances.* In the case of absence from an exam because of a University-sponsored activity, the student should arrange a time to take the exam beforehand.

Final Exam: A final, summative exam will be given **Tuesday, May 3, starting at 10:50AM**. Make-up final exams cannot be arranged. Absence will result in a score of 0.

Quizzes: Generally cover material since the last quiz or exam, some questions will come from assigned reading that week not yet discussed in class. **Make-up quizzes are not offered.**

Figure Analyses: Throughout the semester seminal, modern, primary biochemistry literature will be analyzed in class. Students will be allotted 3-7 days to perform a critical analysis on at least one data-driven figure from an assigned relevant paper. Successful work should identify the following: what methods? what purpose? do the data agree with the narrative? does it connect to other figures? how might this be done differently? are there any references to support your, or the authors', analysis? A typewritten document addressing these points in 300-500 words, with appropriate references cited in the style of *The Journal of Biological Chemistry*, will be submitted for a grade (printed submissions only). There will be two required analyses for which in-class time will be used to discuss the paper on the due date (see schedule); part of the analysis grade is student participation in this discussion. One optional analysis, for additional credit, will be due the first day of biochemistry class after Spring Break, but there will not be an in-class discussion of the paper. **Late work is not accepted.**

Analysis Paper: Students will choose a piece of modern, primary biochemical literature to critique. The analysis should take the form conducted throughout the semester for assigned *figure analyses*, but for the entire paper selected by the student,. Address the "who, what, when, where, and why" of the science reported, and how the work might be done differently and/or improved (*e.g.* you might look for papers that have been written about in a "letter to the editor" of a scientific journal). The student paper should be between 5 and 10 pages (double-spaced, 12-pt. standard serif font, 1" margins max., not counting references and figures) and contain a minimum of 5 peer-reviewed, published references. A copy of the analyzed literature should be appended to the student paper. **This is due by Thursday, April 28 by 10:50 AM**

Tutoring Information for ALL Students:

- **Writing**: Kemper 216
  Contact Dr. Greg Smith for questions: greg.smith@williamwoods.edu
- **Math:** Science and Language 313
  Contact Professor Raymond Hune for questions: raymond.hune@williamwoods.edu

- **SmartThinking**
  Online assistance for English, Math, and most other academic subjects is also available 24/7 through Smarthinking, our e-tutoring service provider. Just click on the "Tutoring" tab at the top of your OWLNet main page and follow the simple directions to connect with a dedicated personal tutor!

  No separate login is required. You will see a list of basic subjects, and a field to do a subject search. For most subjects there are two options, "Drop-in tutoring" and "Offline questions." Drop-in allows you to chat live with a tutor, and offline allows you to submit a question and they email you back the answers.
  Please contact the Academic Advising Office at bonnie.carr@williamwoods.edu if you need additional assistance.
- **Atomic learning**
  All students at WWU have access to this online tutorial program. Atomic Learning is a digital tutorial website with more than 1,500 hours of online professional development and learning resources. This program will assist you in learning how to use different software programs.

  Atomic Learning is accessed through Owlnet. Once logged into Owlnet, the Atomic Learning link is on the far right in the grey section under courses. The log in is your email user name and password. If you have any questions or concerns you can contact the UIT helpdesk at helpdesk@williamwoods.edu.

Grading Scale:

- Percentages from lecture and lab (CHM 441) will be combined into one final grade.
- Lecture is weighted as ¾ of the final grade and lab as ¼.
- Passing final grades must be received in lecture and lab to pass both courses.

Available Lecture Points:

Activity	*Category Total Point Value*
Unit Exams (x3)	300
Final Exam	150
Quizzes (x6)	60
Figure Analyses (x2)	20
Analysis Paper	70
Semester Total	**600**

Final letter grades are based on the percentage of points earned:

Letter Grade Ranges

%Points Earned	*Letter*
<60%	F
≥60%, <70%	D
≥70%, <80%	C
≥80%, <90%	B
≥90%	A

Attendance Policy: Attendance at every class meeting is expected.

Class Conduct and Participation Expectations: Students are expected to work hard, ask questions, and discuss relevant information. Much learning is borne out of open-ended discussions on anatomy & physiology. All participants are expected to be respectful of others.

Policy on Late Work: Late work is not accepted for this course.

ADA Guidelines:

- Students who choose to disclose a disability are responsible for notifying the University of their disability on a timely basis. Questions about disability services should be directed to the University's coordinator for disability services. Contact information is (573) 592-1194 or ada@williamwoods.edu. The office is on the first floor of the Academic Building.

Academic Integrity Policy

- William Woods University, founded on the principle of honesty, has long endeavored to maintain an atmosphere of academic integrity. In all academic work, it is important that the ideas and contributions of others be appropriately acknowledged, and that work that is presented as original is, in fact, original. Insuring the honesty and fairness of the intellectual environment at William Woods University is a responsibility that is shared by the entire campus community. Details of the Academic Integrity Policy can be found at the following web address: https://www.williamwoods.edu/catalogs/1516/undergraduate/policy_detail.aspx?Policies_id=51

Student Outcomes Assessment Policy: 2015-2016 Academic Catalog
https://www.williamwoods.edu/catalogs/1516/undergraduate/policy_detail.aspx?Policies_id=30
Additional Academic Policies can be found at: 2015-2016 Academic Catalog:
https://www.williamwoods.edu/catalogs/1516/undergraduate/policies.aspx

Academic Credit Hour Definition: The University has adopted the following United States Department of Education definition of a credit hour:

A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than:

(1) one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or ten to twelve weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time.

Expected Outside Time Commitment: Following the US DOE definition, students should expect to spend a minimum of 90h outside time for the lecture component (CHM 440) since it is similar in time structure to a 3-credit course. Estimated time is given by activity in the course schedule table (next page).

Add/Drop Deadlines and Other Important Dates:

- Last day to add a class – January 15, 4:30 PM.
- MLK Day (no classes) – January 18
- Last day to drop a class during refund period – February 8, 4:30 PM
- Student Performance Reviews (no classes) – February 16 & 17
- End of Midterm – March 4
- Midterm grades reported – March 8
- Daylight Saving Time begins – March 13
- Last day to drop a class or withdraw from the University – March 21, 4:30 PM
- Spring Break (no classes) – March 28-April 1
- Finals Week – May 2-6

TENTATIVE COURSE SCHEDULE

Topics may change and will be announced in class.
Reading numbers correspond to Tymoczko Chapters.

Dates	Topics	Reading (time required)	Assignment (time required)
12-14 Jan	Introductions, Science Literature, Biomolecules	1, 2 (4h)	
19-21 Jan	Biomolecules, Basic Chem Review, Chromatography I	2, Supp. 1 (2h)	Quiz (1h)
26-28 Jan	Chromatography II, Carbohydrates	Supp. 2, 10 (4h)	Figure Analysis 28 Jan. (1h)
2-4 Feb	Lipids, Chromatography III	11; Supp. 3 (4h)	Quiz (1h)
9-11 Feb	Finish Chromatography	Supp. 3	**EXAM 1, 11 Feb** (10h)
18 Feb	**No Class 16 Feb**, Amino Acids & Protein Structure	3,4 (4h)	
23-25 Feb	Protein Structure, Enzymes review	4,6(2h)	Figure Analysis 25 Feb. (1h)
1-3 March	Enzyme Regulation, Membranes	7, 8, 12 (6h)	Quiz (1h)
8-10 March	Signal Transduction	13 (2h)	**EXAM 2, 10 March** (10h)
15-17 March	Electrophoresis, Digestion, and Metabolism Overview (Respiration and Fermentation)	Supp. 4, 14, 15 (6h)	
22-24 March	Amino Acid Metabolism (Synthesis & Degradation; Urea Cycle)	30, 31 (4h)	Quiz (1h); A topic for your paper should be approved BEFORE you leave for break (2h).
29-31 March	**Spring Break**		Optional Figure Analysis due 5 April (1h)
5-7 April	Fatty Acid Metabolism	27,28 (4h)	Quiz (1h)
12-14 April	Pentose Phosphate Pathway	26 (2h)	**EXAM 3, 14 April** (10h)
19-21 April	Gene Expression and RNA Processing	37,38 (4h)	
26-28 April	Open Topic (*e.g.* Gluconeogenesis, Nucleotide Metabolism, Calvin Cycle, etc.)	TBD (2.5h)	Quiz (1h); paper due 28 April (12h)
3 May	**Tuesday 10:50 AM**	All Reading and Discussions	**FINAL EXAM**