

University of Wisconsin-Eau Claire
Chem 150: Section 801 (Online) - Summer 2009
Survey of Biochemistry
Course Syllabus

Chem 150 is targeted at non-science majors. The prerequisite for Chem 150 is a one-semester course in general chemistry (Chem 103 at UW-Eau Claire). In that course you should have learned about the elements that make up the periodic table and how they combine and interact to produce the matter that makes up the universe, including ourselves. In this course we will focus our attention to the upper right-hand corner of the periodic table to look at the non-metals, and in particular, one of the elements in this group, carbon. Carbon can combine with itself and other non-metals to produce many different types of molecules, more than all the other elements on the periodic table combined. These are the organic molecules, called so because most are derived from compounds that are made by living organisms. In this course we will use a textbook that integrates the topics of general, organic and biological chemistry. We will be moving back and forth through these three areas of chemistry with the intention of not only developing a working knowledge of biochemistry, but also to establish a firm foundation on which to build this knowledge. To help us on this journey, we will focus on the following goals:

- Being able to apply what was learned in general chemistry to develop an understanding that can be used to recognize, classify, and name, and to predict their behaviors.
- Being able to apply the insights gained about organic molecules, and in particular, functional group chemistry, to predict the properties and behaviors of biological molecules.
- And from this, developing an appreciation and basic understanding for how biological systems work at the molecular level.

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Course Materials:

Textbook *General, Organic, and Biological Chemistry, An Integrated Approach, 2nd Edition*; Kenneth W. Raymond; 2008. This textbook is available from the the UW-Eau Claire Book Store. You can either pick up the text from the bookstore in the Davies Center on the UW-Eau Claire Campus, or request that it be shipped to you from their online website (<http://www.uwec.edu/bookstore/students/onlineCourses.htm>)

Course Website We will be using *Desire2Learn* as our course management system. From the [UW-Eau Claire homepage](#), select **Desire2Learn** under the **Current Students** drop down menu, or point your browser to <http://uwec.courses.wisconsin.edu/>. The site will become available to you on Monday, 1. June, 2009.

Companion Website The publishers [Student Companion Website](#) for Raymond's textbook. This website contains online quizzes and video clips related to the material in the textbook.

Grading:	Midterm Exam	100
	Final Exam	100
	Homework	50
	Online Quizzes	50
	Total	<u>300</u>

- Whole letter grades will be assigned at the end of the semester on a percentage basis:

90 – 100%	A
80 – 89%	B
65 – 79%	C
55 – 64%	D
< 55%	F
- +/- grades will be assigned at the end of the semester to students coming in just below one of the cutoffs for the whole letter grades. These will be based on more subjective criteria that includes participation in discussions and overall perceptible effort put into the class.

Chem 150: Survey of Biochemistry, Summer 2009

Section 801 (Online)

Schedule

(June 8 - June 12) Unit 1 - Molecules

- (Review) Concepts: Electronic Structure (3.2)
- (Review) Concepts: The Octet Rule (3.3)
- (Review) Interactions: Ionic Compounds (3.4)
- (Review) Interactions: Covalent Bonds (3.5)
- (Review) Concepts: Molecules (3.6)
- (Review) Concepts: Structural Formulas and Formal Charge (4.1)
- (Review) Concepts: Shape and Polarity (4.2)
- (Review) Interactions: Non-covalent Interactions (4.3)

(June 8 - June 12) Unit 2 - Organic Molecules I - Hydrocarbons

- Families: Alkanes (4.4)
- Concepts: Constitutional Isomers (4.5)
- Concepts: Conformations (4.6)
- Families: Cycloalkanes (4.7)
- Families: Alkenes, Alkynes and Aromatic Compounds (4.8)
- Families: Alcohols, Carboxylic Acids and Esters (4.9)
- Unit 2 Homework due 6/12/09
- Unit 2 Quiz due 6/14/09

(June 13 - June 16) Unit 3 - Physical Properties

- (Review) Interactions: States of Matter (5.1)
- (Review) Concepts: Enthalpy, Entropy and Free Energy (5.1)
- (Review) Interactions: Liquids (5.5)
- (Review) Interactions: Solutions (7.1)
- (Review) Interactions: Solubility of Gases in Water (7.3)
- Interactions: Organic Compounds and Their Interactions with Water (7.4)
- Interactions: Biochemical Compounds and Their Interactions with Water (7.5)
- Interactions: Colloids and Suspensions (7.8)
- Concepts: Diffusion and Osmosis (7.9)
- Unit 3 Homework due 6/16/09
- Unit 3 Quiz due 6/18/09

(June 17 - June 20) Unit 4 - Chemical Properties I - Reactions

- (Review) Chemistry: Reaction Types (6.2)
- (Review) Chemistry: Oxidation and Reduction (6.3)
- Chemistry: Reactions Involving Water (6.4)
- Concepts: Free Energy and Reaction Rate (6.7)
- Unit 4 Homework due 6/20/09
- Unit 4 Quiz due 6/22/09

(June 21 - June 24) Unit 5 - Biological Molecules I - Lipids

- Families: Fatty Acids (8.1)
- Families: Waxes (8.2)
- Families: Triglycerides (8.3)
- Families: Phospholipids and Glycolipids (8.4)
- Families: Steroids (8.5)
- Families: Eicosanoids (8.6)
- Interactions: Membranes (8.7)
- Unit 5 Homework due 6/24/09
- Unit 5 Quiz due 6/26/09

(June 25 - June 30) Unit 6 - Chemical Properties II - Acids and Bases

- Chemistry: Acids and Bases in General (9.1)
- Chemistry: Brønsted-Lowry Acids and Bases (9.2)
- Concepts: Equilibrium (9.3)
- Concepts: Le Châtelier's Principle (9.4)
- Chemistry: The Ionization of Water (9.5)
- Chemistry: The *pH* Scale (9.6)
- Chemistry: Acid/Base Strength (9.7)
- Chemistry: Acid/Base Neutralization (9.8)
- Chemistry: *pH* and Acid/Base Conjugate Pairs (9.9)
- Chemistry: Buffers (9.10) Elaborations
- Unit 6 Homework due 6/30/09
- Unit 6 Quiz due 7/2/09

(July 1 - July 5) Unit 7 - Organic Molecules II - Carboxylic Acids, Phenols and Amines

- Families: Carboxylic Acids (10.1)
- Families: Phenols (10.2)
- Chemistry: Carboxylic Acids and Phenols as Weak Acids (10.3)
- Chemistry: Other Reactions of Carboxylic Acids and Phenols (10.4)
- Families: Amines (10.6)
- Chemistry: Amines as Weak Bases (10.7)
- Families: Amides (10.8)
- Concepts: Stereoisomers (10.9) Elaborations
- Unit 7 Homework due 7/5/09
- Unit 7 Quiz due 7/7/09

(July 9 - July 11) *Midterm Exam***(July 6 - July 12)** Unit 8 - Organic Molecules III - Alcohols, Ethers, Aldehydes, and Ketones

- Families: Alcohols, Ethers and Related Compounds (11.1)
- Chemistry: Nucleophilic Reactions (11.2)
- Chemistry: Oxidation (11.3)
- Families: Aldehydes and Ketones (11.4)
- Chemistry: Oxidation of Aldehydes (11.5)
- Chemistry: Reduction of Aldehydes and Ketones (11.6)
- Chemistry: Reaction of Alcohols with Aldehydes and Ketones (11.7)
- Unit 8 Homework due 7/12/09
- Unit 8 Quiz due 7/14/09

(July 13 - July 16) Unit 9 - Biological Molecules II - Carbohydrates

- Families: Monosaccharides (12.1)
- Chemistry: Reaction of Monosaccharides (12.2)
- Chemistry: Monosaccharides in the Cyclic Form (12.3)
- Families: Oligosaccharides (12.4)
- Families: Polysaccharides (12.5) Elaborations
- Unit 9 Homework due 6/16/09
- Unit 9 Quiz due 6/18/09

(July 17 - July 20) Unit 10 - Biological Molecules III - Peptides, Proteins and Enzymes

- Families: Amino acids (13.1)
- Chemistry: The Peptide Bond (13.2)
- Chemistry: Peptides, Proteins and pH (13.3)
- Interactions: Protein Structure (13.4)
- Interactions: Denaturation (13.5)
- Families: Enzymes (13.6)
- Concepts: Control of Enzyme Catalyzed Reactions (13.7)
- Unit 10 Homework due 7/20/09
- Unit 10 Quiz due 7/22/09

(July 21 - July 29) Unit 11 - Metabolism

- Concepts: Metabolic Pathways, Energy and Coupled Reactions (15.1)
- Concepts: Overview of Metabolism (15.2)
- Concepts: Digestion (15.3)
- Chemistry: Glycolysis (15.4)
- Chemistry: Gluconeogenesis (15.5)
- Chemistry: Glycogen Metabolism (15.6)
- Chemistry: Citric Acid Cycle (15.7)
- Chemistry: Electron Transport and Oxidative Phosphorylation (15.8)
- Chemistry: Lipid Metabolism (15.9)
- Chemistry: Amino Acid Metabolism (15.10) Elaborations
- Unit 11 Homework due 7/27/09
- Unit 11 Quiz due 7/29/09

(July 30 - August 1) *Final Exam*

Chem 150: Survey of Biochemistry, Spring 2008

Section 801 (Online)

Course Management

Desire2Learn:

We will be using *Desire2Learn (D2L)* as our course management system for this online course. As a registered student in Chem 150, Section 801, you should be able to log onto the site using following URL

<http://uwec.courses.wisconsin.edu/>

Under the “My Eau Claire Courses” list you should see a link labeled “CHEM 150.801”; this will take you to our course site. There are two menu bars at the top of the page, which should remain at the top of the page regardless of where you are in the site. The upper menu bar provides some accessory tools for managing the course, These include:

- *My Home* - This takes you back out of the course site to the “My Eau Claire Courses” page, which you saw when you first logged into the *D2L* site and selected “CHEM 150.801”. This is where you would go if you wanted to jump to other online courses you may be taking this semester.
- *Email* - This opens an email client that you can use to send email messages to the other members of the class.
- *Schedule* - This opens a calendar on which I have placed the due dates for homework assignments, exams, and quizzes. You can also enter your own personal events into the calendar. On the Course Home page you will find a box labeled “Events”, which list a few of the up-coming events in the calendar.
- *Locker* - This where you can upload and store files on the *D2L* server in your own personal file space. You may want to do this, for example, if you want to upload, download, or access files from more than one computer, or just store them in a safe location where your dog can't eat them.
- *Logout* - This will log you out of *D2L*.

The lower menu bar contains links to various locations within the course website. These include:

- *Course Home* - This will take you to the course home page, where you will find an array of informational boxes, including one for storing *Bookmarks*, one for listing up-coming *Events* in the calendar, one for listing *News* items which I post related to the course, and one that contains various *UW-Eau Claire Resources*. These resources includes links to the UW-Eau Claire homepage, help files under the heading *LTS Help Collection*, which includes a collection of help files for using *D2L*, And a link that will check to see if your computer is configured properly to use *D2L*.

- *Content* - This will take you to the main content for the course. The course is broken up into 11 topical units. Each unit will contain links to the following pages:
 - *Readings and Annotations* - Lists the reading assignments in your textbook by sections and provides annotations that highlight some of the important points in these readings.
 - *Elaborations* - These are pages that expand on some of the concepts that are introduced in the readings. They also contain example quiz questions that will help you gauge your understanding of the concepts.
 - *Suggested Problems* - This will take you to a page of suggested end-of-chapter problems in the textbook. The answers to the odd-numbered problems can be found in Appendix D of the textbook. You will not be asked to hand in the answers to these problems
 - *Assigned Problems* - This is the assignment you will be handing in. There is one assignment per unit. You will not need to hand in the first unit's assignment, since it should be mostly review. The due dates for these assignments are listed in the course schedule. The mechanism for submitting your assignments is described below under the heading "Graded Items"
- *Classlist* - This will take you to a page that lists the other members of the class and provides some tools for communicating with one another.
- *Discussions* - This will take you to a page where you can participate in discussion forums. I plan to set up several forums, including one to post and respond to questions about course logistics, one to post and respond to questions about chemistry, and one to chat about non-course related topics.
- *Grades* - This will take you to your entry in my grade book, where you can monitor and check your grades throughout the semester.
- *Quizzes* - This will take you to the online quizzes. The due dates for the quizzes are listed in the course schedule. There will be one quiz per Unit and they will become available to you upon completion of the *Homework* assignment for the corresponding Unit.

Graded Items:

- *Exams* - Because of the compressed nature of this course, there will be only two exams, a midterm and a final. The final will not be comprehensive. These will be proctored exams. For those two exams you will need to come to the UW-Eau Claire campus. For each, there is a three-day window in which you should arrange with me to take the exam (wgallagh@uwec.edu 715-836-5388) These dates are shown on the schedule, and each includes a Saturday to accommodate a standard workweek. If this will present a huge obstacle for you, contact me so that we can discuss alternative arrangements for taking the proctored exams.
- *Homework* - The due dates for the assigned homework problems are shown on the attached schedule and can also be found in the schedule on the class *D2L* site. Each assignment is worth 5 points; you will receive 2 points for completing the assignment on time and up to an additional 3 points for answering the questions correctly. You may handwrite your answers and scan them to a file, preferably in Acrobat (.pdf) format, or type them into a word processing file. I can read Word or plain text files, otherwise, convert them to a .pdf file. If you need to submit more than one file for a given assignment, compress them first into a zipped archive file. This can be done on Windows computers by right-

clicking on the Desktop and selecting “Compressed (zipped) Folder” under the “New” item in the popup menu. Drag your files into the .zip folder and then upload the .zip folder to the appropriate Dropbox on the the course D2L site. On Macintosh computers, place all of your files into one folder, right-click (control-click) on the folder, and select “Create Archive of...” in the popup menu. This will create a .zip file with the same same as the folder. Upload this file to the appropriate Dropbox on the course D2L site. Please use descriptive file and folder names and be sure to use the appropriate Dropbox for the assignment you are submitting. I anticipate that there will be some bumps in the road to getting this to work. I am willing to work with each of you on arriving at a workable solution for submitting the homework assignments.

- *Quizzes* - The quizzes for each unit should be completed within 48 hours of when the corresponding homework assignment is due. The actual due dates have been entered in the schedule on the *Desire2Learn* site. You will be able to take the quiz after you have submitted the corresponding Homework assignment. Each quiz is worth 5 points; you will receive 2 points for completing the quiz on time and up to 3 additional points for answering the questions correctly.

Technology requirements:

To complete this course, you will access to a computer with broadband internet access. There is a link on you *D2L* home page that you can use to test your computer and browser for compatibility with *D2L*. *D2L* recommends that you use a recent version of *Internet Explorer*, *Firefox* or *Netscape* for your browser. While not recommended, I am using *Safari*, and that seems to work fine as well. You will want to have your browser configured to handle *Flash*, *Quicktime*, *Real Media* and *Windows Media* Players. You will also need to have Java and JavaScript enabled. I have developed the course website using *Safari* running under *Mac OS X*. If you are using a different platform, I am relying on you to alert me if something is amiss with the site at your end. You will also want access to a digital scanner for submitting homework assignments. If you do not have your own scanner, you might check your local library or internet cafe.