Chemistry 120, Fall 2017
Selected Topics in Chemistry: A Survey of General, Organic, and Biochemistry

> "Science is not technology, it is not gadgetry, it is not some mysterious cult, it is not a great mechanical monster. Science is an adventure of the human spirit. It is essentially an artistic enterprise, stimulated largely by curiosity, served largely by disciplined imagination, and based largely on faith in the reasonableness, order, and beauty of the universe of which man is part."
>
> —Warren Weaver, American scientist and mathematician

Meeting Time	MWF 8:15-9:20 am
Location	OSB 423
Instructor	Dr. Annette Neuman
E-mail	annette.neuman@emory.edu
Office	OSB 404
Office Hours	Tuesdays 1:00-3:00 pm, Wednesdays 1:00-3:00 pm, Thursdays 9:45-11:45 am (drop-in) Or by appointment (e-mail me to set up a time)

Description

All life depends on molecules containing carbon, known as organic compounds. Chemistry 120 is a one-semester survey focusing on organic chemistry and biochemistry designed for non-science majors. In this class, we will investigate concepts in organic chemistry and biochemistry through the lens of medicinal chemistry. **This class has no prerequisite.**

Oxford College is dedicated to a liberal arts education. The ultimate goal of a liberal arts education is not to provide a collection of knowledge, but rather to teach you how to think and how to learn. The study of science is an integral part of a liberal arts education. The mastery of chemistry requires a thorough understanding of fundamental principles and the ability to use those principles to analyze, classify, and predict. Your success in Chemistry 120 will not only provide you with knowledge about the molecules of life, it will also hone the critical thinking skills that will be valuable in your career.

Learning Outcome

The primary goal of this course is to train you to explain how chemical structure affects function.

Content Knowledge

To succeed in this class, you must master the following topics:

1. atomic and molecular structure
2. structure and bonding of organic molecules
3. how medicines work
4. structure and functions of biological molecules

Course Materials

Required textbook: *General, Organic, and Biological Chemistry*, 3rd edition, by Laura D. Frost and S. Todd Deal

Bring a notebook and pen or pencil to every class. It is not necessary to bring your textbook.

Required for lab: Carbon-copy lab notebook (you must have this *before* your first lab meeting)
Safety glasses (these may be purchased during the first lab meeting)

Grading

Your course grade will comprise the following components:

Homework	10 @ 10 pts	100 pts
Short writing	5 @ 10 pts	50 pts
In-class exams	3 @ 100 pts	300 pts
Mini-research paper		50 pts
Research paper		150 pts
Participation		50 pts
Lab quizzes	7 @ 5 pts	35 pts
Lab notebook	10 @ 10 pts	100 pts
Lab reports	6 @ 20 pts	120 pts
Total		955 pts

This is an approximate grading scheme; the instructor reserves the right to make minor modifications to assignments.

Note that this class does not have a final exam! Your last obligation to this class is to submit your final paper on Reading Day.

Your final letter grade will be determined by the usual scale. *There is no automatic rounding or curve to course grades*.

	93		90		87		83		80		77		73		70		67		60	
A		A-		B+		B		B-		C+		C		C-		D+		D		F

In fairness to all students, grades must be based solely on your performance in the course. If you believe I have misgraded an assignment, please bring this to my attention immediately. Otherwise, **under no circumstances will grades be open for negotiation.**

Partial credit will be awarded at my discretion and is not open for negotiation.

Homework

Diligently working problems is one of the major keys to success in chemistry. To this end, you will choose a small group during the first week of class. You must work with your group on each problem set and submit a single copy of your assignment. ***Your submission must reflect the collaboration of all group members***.

Writing Assignments

Several brief writing assignments (1-2 pages) will be assigned throughout the semester. Each of these will be graded out of 10 points.

Exams

We will have three in-class exams. These exams will be given during the regularly scheduled class period.

Exam 1	Friday, September 22	Atomic and molecular structure; introduction to organic chemistry; functional groups
Exam 2	Friday, October 27	Isomers; energy; chemical reactions; attractive forces; acids and bases
Exam 3	Friday, December 1	Medicinal chemistry; amino acids; proteins

Review Sessions

Review sessions will be held during the class period immediately before the scheduled exam. Please come to class prepared with questions!

Makeups Makeup exams are not given after missed exams. In extenuating circumstances, it may be possible for a student to take an exam ahead of time, if I am given at least seven days' notice. Under no circumstances will a makeup exam be given *after* the scheduled time and date of the exam.

Mini-Research Paper In our first lab meeting, on August 24, we will discuss your first writing assignment. You will choose a plant to study how its component molecules are isolated and used. You will submit a 2-3 page paper (hard copy) on the topic of your choosing by 4 pm on Friday, September 15.

Research Paper In the second half of the semester, each student will choose a medicine to research. You will study how it was developed, how it is synthesized, and how it works in the body. You will share your findings through a research paper and a presentation to the class.

A hard copy of your final 4-6 page research paper will be due in my office by 4:00 pm on Reading Day, Wednesday, December 6. In recognition of the fact that **excellent writing takes time**, several intermediate deadlines will be enforced. The writing schedule will be as follows:

Friday, October 6	Research proposal due by 4 pm (e-mail or hard copy)	10 points
Friday, November 3	Outline of research paper due by 4 pm (e-mail or hard copy)	15 points
Friday, November 17	Rough draft of research paper due by 4 pm (hard copy required)	25 points
Wednesday, December 6 (Reading Day)	Final draft of research paper due by 4 pm (hard copy required)	100 points
Total		**150 points**

Participation You will derive the greatest benefit from this class if you are an active participant. This means contributing substantively to class and group discussions, asking and answering questions, and being a productive member of your group.

Late Assignments All late assignments will receive an automatic grade reduction of 5% per day late. If an assignment is due at the beginning of class, submitting it after class counts as one day late.

Expectations Cell phones **may not be used** during class or exam periods. Laptops and tablets will be permitted at only at designated times to carry out scholarly research.

You should minimize your trips to the restroom or other reasons for leaving during class. You may excuse yourself from class if necessary, but this is distracting and should be minimized.

Take responsibility for your own successes and failures. Work hard, and don't make excuses!

Honor Code Academic integrity is crucial to the Oxford community. Therefore, as in all courses, you will be expected to adhere to the Oxford College Honor Code. Academic misconduct, as defined in the honor code, will not be tolerated and will be immediately referred to the Honor Council. **Collaboration is not permitted on exams or research papers.**

Disability Accommodations

If you are registered with the Office of Accessibility Services (OAS), please submit the documentation letter to me during the first week of the semester so that I can make appropriate accommodations.

Attendance

All students are expected to attend all lecture and laboratory sessions. However, I recognize that emergencies can arise that may result in absence from class. You should notify me if an absence is due to illness or other emergency. You are responsible for all material covered in lecture if you are absent.

Besides missing class, these also count as an absence:

1. Being late to class two times. (This means coming in after I've finished checking the class roster.) If you come in late, it is your responsibility to see me immediately after class to ensure that you are marked as being tardy and not absent. No adjustments will be made at a later time.
2. Coming to class more than 15 minutes late.
3. Leaving class early.
4. Going in and out of class.
5. Being inattentive or working on other assignments in class.

You are allowed *3 absences* from lecture. If you exceed the 3 absence limit for *any* reason, by any combination of absences and tardies, you will:

1. Lose 2 points for the next 2 absences (absences 4 and 5)
2. Lose 3 points for each additional absence

Note that each point deducted is a ***percentage point*** of your final grade. Therefore, excessive absences will have a significant negative impact on your course grade.

Chronic absences due to severe illness or other extenuating circumstances are to be handled through the office of the Dean of Academics, at the student's initiative. Only that office can dictate a deviation from course policy.

Canvas

The Chemistry 120 page on Canvas will be the primary means of communicating outside of class. It will also house supplementary course resources. **Please be sure to check the course page daily.**

Student Work

Occasionally I will photocopy assignments that you turn in for inclusion in my teaching portfolio. Furthermore, student work submitted as part of this course may be reviewed by Oxford College and Emory College faculty and staff for the purposes of improving instruction and enhancing Emory education.

Tips for Success:

1. Develop a good attitude. Chemistry can be both fun and interesting if you allow it to be.
2. WORK PROBLEMS! The assigned problem sets are a good place to start, but you should also work lots of problems from the textbook.
3. Manage your time and your life. There are LOTS of different ways you can choose to spend your time. None of them are an excuse for poor performance in the classroom. Remember why you are here.
4. Memorizing facts is important to establish a basis for your knowledge but is not sufficient for success in Chemistry 120. You must be able to use your knowledge to think logically and analytically. Many of the test questions will require you to apply your knowledge to unfamiliar situations.
5. Come to class every day, stay alert, and take good notes.
6. Form a study group with a few classmates and work problems together.
7. Use the resources available to you: office hours, review sessions, and your classmates are all excellent resources to help you achieve success in this class.
8. The pace of this course is rapid. Stay current with the material and don't get behind.

Anticipated Class Schedule (subject to minor changes):

Day	Date	Topic	Assignment Due
W	Aug 23	Introduction, syllabus, what is chemistry?	
F	Aug 25	Natural and man-made chemicals, thinking like a scientist, classification of matter	Writing assignment: What is the difference between natural and man-made substances?
M	Aug 28	Structures of atoms, periodic table, isotopes	
W	Aug 30	Electron energy levels, formation of ions	
F	Sep 1	Ionic bonds, covalent bonds, Lewis structures	
M	Sep 4	NO CLASS—LABOR DAY	
W	Sep 6	Moles, molar mass, balancing equations	
F	Sep 8	VSEPR theory	PS 1
M	Sep 11	Electronegativity and polarity	
W	Sep 13	Organic compounds, alkanes, condensed structural formulas, line-angle formulas	PS 2
F	Sep 15	Hydrocarbons and functional groups	Mini-research paper
M	Sep 18	Case study: Emtricitabine	Case study questions due in class
W	Sep 20	Review	PS 3
F	Sep 22	**Exam 1 (8:15-9:30 am)**	
M	Sep 25	Library session	
W	Sep 27	Constitutional isomers and stereoisomers	
F	Sep 29	Enantiomers and racemic mixtures	
M	Oct 2	Thermodynamics, kinetics, and energy	
W	Oct 4	Types of chemical reactions	PS 4
F	Oct 6	Condensation and hydrolysis reactions	Research proposal
M	Oct 9	NO CLASS—FALL BREAK	
W	Oct 11	Case study: Prilosec and Nexium	Case study questions due in class
F	Oct 13	Attractive forces	PS 5
M	Oct 16	Solutions	Case study writeup
W	Oct 18	Acids and bases	PS 6
F	Oct 20	Case study: Respiratory distress	Case study questions due in class
M	Oct 23	What is a drug?	
W	Oct 25	Review	PS 7
F	Oct 27	**Exam 2 (8:15-9:30 am)**	
M	Oct 30	How drugs are discovered	
W	Nov 1	Drug development	
F	Nov 3	NO CLASS	Research paper outline
M	Nov 6	Amino acids	
W	Nov 8	Proteins	PS 8
F	Nov 10	Enzymes, receptors, agonists, and antagonists	
M	Nov 13	Pharmacokinetics I	
W	Nov 15	Pharmacokinetics II	PS 9
F	Nov 17	Lipinski's rules	Research paper draft
M	Nov 20	Drug metabolism	
W	Nov 22	NO CLASS—THANKSGIVING BREAK	
F	Nov 24	NO CLASS—THANKSGIVING BREAK	
M	Nov 27	Drugs in the news	
W	Nov 29	Review	PS 10
F	Dec 1	**Exam 3 (8:15-9:30 am)**	
M	Dec 4	Reflection	
W	Dec 6	NO CLASS—READING DAY	Research paper