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Fall 9-1-2021

CHMY 123.00: Introduction to Organic and Biochemistry

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Recommended Citation

Martin, Brooke D., "CHMY 123.00: Introduction to Organic and Biochemistry" (2021). *University of Montana Course Syllabi*. 12144.

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Course Description : CHMY 123 is a course with two halves. In the first 6-7 weeks you are introduced to “**Organic Chemistry**” – which these days means chemistry based on the element Carbon. Chemist have a way a systematically naming chemical compounds (“nomenclature”) that you will start to use, and you will learn how you can predict chemical and physical properties of molecules just by looking at the structures of molecules - that you will also learn how to draw. You can think about the first half of the course as building your toolkit that you will use to describe much larger molecules – called macromolecules - that define the structures and properties of biology.

You can think of the Chemistry of Biology – or life – as a lot of molecules interacting with each other to build ever more complex systems. The repetitive combining of a small “organic” group of molecules is called polymerization and it is an efficient way to build large molecules. Knowing the chemistry of these large molecules then explains how they go about their role in biology – it might be a metabolic function or it might be information transfer. Together this characterizes life as we know it: the chemistry of biology – also known as - “**Biochemistry**”.

This is a list of things we want you to learn and we will measure (i.e test) how well you have learned them (Learning Outcomes).

1. Can you name simple organic compounds using the systematic naming system (nomenclature)? You should get very good at this.
2. If you look at the structure of an organic compound, how well can you predict how it will interact with another molecule and how does that dictate its function?
3. How familiar are you with the ionization of functional groups (this means turning uncharged molecules into charged ones). Do you understand that this is the same as Acid/Base chemistry? Can you explain this for specific molecules like amino acids, proteins, and nucleic acids? Can you explain why this changes the function of the molecule?
4. Some proteins are called enzymes. Can you explain that enzymes are catalysts? How well can you explain the thermodynamics (energy requirements) and kinetics (chances that molecules will run into each other) in enzyme catalyzed reaction?
5. Life occurs in the presence of a reactive gas we call oxygen. How familiar are you with the reactions of oxygen with organic compounds (oxidation-reduction reactions). How well do you understand that you don't always need oxygen for oxidation-reduction reactions? How well can you explain the role of these types of reactions in metabolism including the energy requiring and energy yielding steps.
6. Can you describe how the oxidation of organic substrates can be coupled to the production of chemical energy in biological systems?

7. In biology, an organism is what it is and not something else because it was programmed to be that thing. Can you describe how biochemical mechanisms can program in this information? Can you describe the biochemistry that copies information from one molecule to another? (replication, transcription, and translation).

How to get into this class aka Pre-requisites and Co-requisites for CHMY 123: It is helpful to have a bit of chemistry background so a grade of "C-" or better in CHMY 121 is expected. In some –very rare - cases this can be over-ridden with permission of the instructor. CHMY 124 is the Introduction to Organic & Biochemistry Lab course that accompanies CHMY123. Most majors that require CHMY 123 also require CHMY 124, which is listed as a co-requisite for that reason. You can take them separately.

Things you need for this course - Course Materials.

- **most is included in your tuition.** The access code for the first two are available through the RedShelf link in the Moodle webpage.
- **Included: Text Book: Fundamentals of General, Organic and Biological Chemistry. 8th Edition** by McMurry, Ballantine, Hoeger and Person, Pearson Education Inc., 2017. CHMY 123 is included in the bookstore's Inclusive Access Program. This gives you access to your required course materials, including an e-copy of the textbook. A loose-leaf paper copy of the textbook is also available for a nominal charge – inquire at the University Bookstore.
 - **Included: Mastering Chemistry plus** online homework. This is included through the bookstore's Inclusive Access Program. You will need to register as a student in the course to access the homework www.pearson.com/mastering. The course ID is **martin11607**. The course name is **CHMY123 Fall 2021**.
- Molecular Model Kit: CHMY 123 model kit, available in UM bookstore. You need this.
- **A scientific calculator.** A scientific calculator is sometimes useful for this course but you could get by most of the time without one.
- We do a lot through the Moodle portal besides just getting e-text and homework access. You will use it to submit recitations and exams. A laptop computer with wi-fi will be needed. See Mansfield Library about a loaner laptop if you do not have one that will work for you.

How the course works: Moodle will be used to provide content to you and as a message board for grades – the “official” gradebook is kept by the Professor. The exception is the on-line homework. You sign up for homework through Moodle but then use the second platform that you access via Pearson mylabandmastering. Your homework grade is added in at the end.

Weekly Schedule :

Recitations: M at 10 AM or 1 PM. You will do one of these IN PERSON per week. Check cyberbear for rooms. If you miss a recitation for unavoidable reasons you can have up to two weeks to go over the recitation and its associated Quiz with your TA or LA. This is really only for emergencies – remember that the TA and LAs are students too and their time with you is precious. Use it well.

Lectures: MWF (3 days) 9:00-9:50pm UM-Msla Campus | ISB 110

Lectures: are in person and held in ISB 110. The lecture is where we cover the CONTENT of the course and the powerpoints for each week will be posted on Moodle. This will give you something to annotate with notes and to give you a permanent copy to follow along. I want to see a lot of you writing notes during the lecture. The main thing about the lectures is that they are an opportunity for you – the student – to ask me – the teacher – any questions you have about the material and clear up your understanding. Remember – if you have a question – so does someone else. Questions about Chemistry are my favorite!

COVID: As of now the University is advising us that face coverings are required in lecture and in recitation. The policy will be re-evaluated on September 20th but I think it is pretty safe to assume this will be in place all semester. Hand sanitizer and sanitizing wipes are available so take advantage of them to wipe down your seat and desk area every time. The first time you come to lecture, chose a seat that is not right next to somebody else – in other words – try to have a vacant seat next to you. We will have a seating map –put your initials on that seat. That will be your seat for the rest of the semester. EVERY time you come to class, swipe your GrizCard in the GrizCard reader. If need be, the Missoula City County Health Department can use the attendance information along with the seating map, to do contact tracing.

Recitation Exercises: are guided tutorial exercises. Recitations will be posted on Moodle the week before the recitation meets, usually on Friday - please print out a copy and take it with you. They are designed to (mostly) FOLLOW the lecture material and to be review. Every semester there is always the one thing that just doesn't match up but we will do our best to make them all meaningful reviews for you.

Usually you will need to build a molecule using your model kit and answer questions about it. Many of the model builds are challenging so work on them ahead of time. The TAs and LAs will look at your models to see if you have built them properly. These tutorials are a chance for you to get a deeper understanding of the material and completion of these is really closely associated with success in this course. The TAs and LAs are there to help you go through the tutorial so make sure you don't leave before you have asked all the questions you have on

the topic. Work in small groups to go through the tutorial. If you know something really well – be the one that explains it to someone else. Ask and answer questions!

Half way through the recitation a short 10 point online quiz will open. This is assessed material so you will do this part on your own BUT – you can use the tutorial you just finished as well as the model you built to help you answer the quiz. There are thirteen 10 point quizzes that will begin at half past the hour. The best ten quizzes will contribute to a total of 100 possible points from the recitations. Completion of more than ten recitations can contribute up to 30 points of extra credit for your grade.

In Class Activities: As time permits, we will have one or two in-class activities that will be followed up with an LA led online discussion. There will be some nominal – up to five points – extra credit associated with this for active participants.

Online Homework (Mastering Chemistry): is required and will be graded.

There is ~ 2 hours of homework per Chapter. Some students take less or more time to so give yourself plenty of time to go through it slowly. The homework is set BEFORE you see the lecture material and the point is to get you working on and thinking about the material BEFORE lecture starts. You will have lots of opportunities to change your answer after the lecture so come to class with your questions.

Homework assignments are generally due on Sunday evenings at 11:45 PM or the evening of the last lecture day on that topic – whichever is later. Because the plan is that you work on homework CONCURRENTLY with the lecture, the homework must be submitted on time in order to receive full credit for the assignment. Each of the homework assignments is worth 10 points. If the homework is not completed by the due date a penalty of 5% will apply to that assignment for up to two weeks.

Exams: This is your chance to really show off your mastery of this new topic! There are 4 x 100 point midterm exams all held on Wednesdays (see Calendar below) during lectures. Exams are mostly multiple choice with one or two written answers. The exams are closed book so help sheets, periodic tables, calculators and any other electronic devices are NOT permitted. Exams are based on the new material covered from the previous test but the very nature of the chemical sciences is that this knowledge is cumulative.

Because life happens, your lowest exam grade is dropped. If you have to miss an exam due to unforeseen circumstances that will be your lowest grade (obviously as it will be zero) and it will be dropped. We will retest you on the material on the final anyway. There are no make-up exams – we just let you drop that exam and it doesn't affect your grade. Everyone's best three exam grades go into their final grade. A word of caution – life does happen. You

never know when you will have to drop an exam due to events you can't possibly predict. Treat every exam as if it will be one of the three that is counted!

In case you missed it: **No make-up exams will be given.**

Final Exam: The final exam is comprehensive and worth 200 pts (and cannot be dropped). The final exam is scheduled Tuesday, December 14th 8AM-10AM. The exam date is set by registrar and cannot be changed. The final exam is mandatory and IN PERSON.

Schedule your plane reservations, internships, employment for **AFTER THIS TIME. No early finals will be given!**

Letter Grades : The points from best 3 exams (300) + final exam (200) + best 10 quizzes from recitations (100) + homework (100) gives a total of 700 points. Letter grades will be assigned using the traditional 90-80-70-60; A-B-C-D format. The use of + and – grading is at the discretion of the Professor.

Getting Help with CHMY 123

- TA (teaching assistant) for your recitation section has office hours, to be announced.
- Study Jams (regular study groups led by a student tutor) <https://www.umt.edu/study-jam>
- check the TRIO website to find out if you qualify for TRIO assistance
<http://www.umt.edu/trio/apply.php#Eligibility>
- names of private tutors can be found through the Office of Student Success
<http://www.umt.edu/oss/> .

Student Conduct and Academic Honesty

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. The Code is available at <http://www.umt.edu/student-affairs/dean-of-students/default.php>

Students are especially reminded that plagiarism – representing someone else's work (another student or internet content – Google/wikipedia) as the student's own without evidence of independent contribution - and misconduct during examination fall under items 1 and 2 of the student conduct code. The majority of CHMY 123 students are honest and responsible. As academic misconduct may affect those students, please be advised that I do enforce the Student Conduct Code in order to protect the honest students from academic misconduct.

Disability Modifications : Students with disabilities should contact Disability Services for Students (DSS) in the Lommasson Center room 154, phone 406.243.2243 and 406.243.4216. Any student with a disability that may prevent you from fully demonstrating your abilities, should contact the instructor and DSS as soon as possible. Testing services gets very busy and fully scheduled early so get any modifications you need to succeed in this course in place early.

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UM Policies on drop/add and grade changes- dates are set by the registrar's office:
<https://www.umt.edu/registrar/calendar/autumn-2021.php>

- Sept 20th by 5:00 Last day to drop individual classes on CyberBear with refund.
- Nov 1st is the last day to drop with the signatures of your advisor and the instructor with W appearing on your transcript.
- Nov. 2–Dec. 10, 2021 drops with the signatures of your advisor, the instructor and the Dean of the College and WP or a WF will appear on your transcript
- *UM policy allows you to change your grade option (typically occurs when students are not doing well and they change from traditional letter grade to credit/no credit option) up to the last regular day of classes, Dec 10th, 2021*

Semester Schedule : We start at Chapter 12 and go sequentially through to Chapter 26, omitting Chapter 25. Portions of some chapters sometimes need to be omitted but we cover all the important pieces. The dates given in the calendar are subject to change based on the pace of lecture. At times we may be slightly ahead or slightly behind but the goal is to cover 3-4 chapters prior to testing.

CHMY 123 Intro to General Organic and Biochemistry: FALL 2021

Date	Lecture
August 30	Lecture 1: Introduction to Organic and Biochemistry
September 1&3	Chapter 12: Alkanes.
Sept 8 & 10	Chapter 13: Unsaturated and Aromatic Hydrocarbons
Sept. 13, 15, 17	Chapter 14: Compounds with oxygen, sulfur or halogens
Sept 20	Chapter 15: Functional Groups: Aldehydes and Ketones
Sept 24	Chapter 15: Functional Groups: Aldehydes and Ketones

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Date	Lecture
Sept 27	Chapter 15: Functional Groups: Aldehydes and Ketones
Sept 29 & Oct 01	Chapter 16: Amines
Oct 4	Recitation 5 – Amines & Carboxylic Acids
Oct 4, 6, 8	Chapter 17: Carboxylic Acids and their Derivatives
Oct 11	Recitation 6 – Esters and Amides
Oct 11	Chapter 18: Amino Acids and Proteins
October 13	EXAM 2 – FUNCTIONAL GROUPS
Oct 15	Chapter 18: Amino Acids and Proteins
Oct 18	Recitation 7 – Chirality and Amino Acids
Oct 18	Chapter 18: Amino Acids and Proteins
Oct 20, 22	Chapter 19: Enzymes
Oct 25	Recitation 8 - Proteins
Oct 25,27,29	Chapter 20: Carbohydrates
Nov 1	Recitation 9 - Carbohydrates
Nov 1	Chapter 21: The Generation of Biochemical Energy
Nov 3	EXAM 3 - Biomolecules
Nov 5	Chapter 21: The Generation of Biochemical Energy
Nov 8	Recitation 10 - Bioenergetics
Nov 8	Chapter 21: The Generation of Biochemical Energy
Nov 10, 12	Chapter 22: Carbohydrate Metabolism
Nov 15	Recitation 11 – Carbohydrate Metabolism
Nov 15,17,19	Chapter 23: Lipids
Nov 22	Recitation 12 - Lipids
Nov 22	Chapter 24: Lipid Metabolism
Nov 24-26	Thanksgiving Break – no classes
Nov 29	Recitation 13 –
Nov 29	Chapter 24: Lipid Metabolism
Dec 01	EXAM 4: Metabolism
Dec 03	Chapter 26: Nucleic Acid and Protein Synthesis
April 19	Recitation 14– Nucleic Acids
Dec 6 & 8	Chapter 26: Nucleic Acid and Protein Synthesis
Dec 10	Last Day of Class –Wrap up and Final Exam Review
Tuesday Dec 14	FINAL EXAM: 8 AM-10 AM