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CHMY 124.00: Introduction to Organic and Biochemistry Lab

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Introduction to Organic & Biological Chemistry Laboratory

Instructor:

Dr. Brooke Martin – Res. Assoc. Professor and Instructor

Chem Building 215

Brooke.Martin@umontana.edu

Student Hours: Mon & Wed, 11 AM-Noon and by arrangement. Zoom appointments available.

Course Description

CHMY 124 introduces general, organic and biochemistry laboratory skills and concepts. During this class you will synthesize (make) organic compounds or isolate them from biological materials. You should recognize most compounds as they will be common in household (consumer) products. Once you have made or isolated the compound, you will purify it and then analyze it using “wet chemistry” and sometimes using some higher end analytical instruments.

While the products should be familiar to you, one of the main goals of this class is to have you using good scientific methods and practices. You will make observations – how does something look - or even smell. You will use instruments to measure weights or volumes with known precision. You will record these observations, then develop or describe quantitative relationships between variables (those are the things you measured and wrote down). Once you have developed these relationships you will apply that pattern to other materials where you can't directly measure the result (an “unknown”). Along the way you will learn to use graphing and spreadsheet software, develop good note-keeping practices and critical thinking skills. By this end of this semester you should have a chemical appreciation of the natural world around you and how it works.

CHMY 123 is a pre-/co-requisite for this course. A grade of C- or better in CHMY121 or an equivalent general chemistry course is a pre-requisite for CHMY123 and 124.

Weekly Schedule

Each week there is a pre-lab component to complement the in-person lab part that needs to be done – obviously - before the lab. It is designed to have you come into lab prepared, to work safely, to help you get the most out of your time during the lab.

For this semester - the pre-lab component is delivered remotely as your mandatory CHMY124 R00 class. Each weekend you will have one or two YouTube videos to watch that take you through the lab and some of the basic organic and biochemical principles behind it. Take careful notes because you will need them to take a short (5-10 question) Quiz. The quiz will include questions similar to (but not necessarily identical to) the ones in your lab notebook. This opens (after the first week) DURING THE PRE-LAB meeting time. *This semester that is Mondays from Noon-1 PM.* Note that the quiz window is open in the SCHEDULED PRE-LAB time so nobody should have a time conflict. The one exception is the first week where you will do your “pre-Lab” quiz in the lab and again on Feb 21/22 to accommodate the President’s Day holiday. Once the Quiz opens, and the videos will no longer be available. DO NOT WAIT UNTIL THE LAST MINUTE to watch the videos. While I usually leave the video up until sometime in the hour before the quiz opens - I may take the video off-line up to three hours ahead of time. The pre-lab quizzes, make up a portion of your grade.

CHMY124 – Spring 2022

COVID-19 Considerations

CHMY124 is by definition a hands-on wet lab. In-class, in person, on campus attendance is required for all wet lab components of this class. You may only miss one lab per semester for any reason, including COVID, and you will need to provide documentation that your absence is unavoidable. Lab classes cannot be made up in later weeks as equipment and reagents will no longer be available. In the case of a documented unavoidable absence, we will allow you to shadow a Zoom buddy for these labs – usually your lab partner. You are expected to actively *participate participate* with your Zoom buddy during the lab by asking questions, recording the observations yourself, and interacting as much as possible. You are expected to complete all “Dry lab” elements (work with interactive apps and online research and data analysis) and use the data collected by you and your Zoom-mate to complete your lab report. It is strongly recommended that you contact your lab partner/Zoom-mate as soon as possible as it can be difficult to organize at the last minute.

Because it is important that we all stay safe and healthy in order to be able to complete the on campus component of this laboratory course, we have a few COVID protocols:

- Cloth face coverings (100% cotton, surgical masks or K95 masks) are mandatory as per University direction. The University may re-evaluate this policy, however it is probably safe to assume it will be in place for the entire semester. If you have a medical condition that prevents you from wearing a mask, please contact the Office of Disability Equity (ODE) (formerly Disability Services for Students) and have documentation in place before you enter the lab for the first time. <https://www.umt.edu/disability/>
- If you are experiencing symptoms of COVID-19 please do not enter the lab and alert your TA. Organize ahead of time to participate remotely (one time only). Please go to Curry Health Center right away 406-243-2122 to receive a COVID test whether or not you believe your symptoms are due to COVID-19. This is for your personal well-being and for the other lab participants. You will also need the documentation before you receive credit for the remote attendance lab. If you missed it earlier – **only one time per semester**. The learning goals of this lab are best achieved when you make your own measurements and observations.
- **Disinfect often**. Use the hand sanitizer dispensers. Sanitize any common equipment before AND after using it. In addition to balances and reagents – this also include things like benches and workspaces. In short – if it isn't your personal equipment or space and you touch it – disinfect it.

Course Materials and Electronic Devices

- The labs and lab notebook are now included in your tuition. Pick up the lab-pac (CHMY124 lab notebook) at the bookstore before your first Lab.
- Safety Goggles, green with elastic strap (available in bookstore, required)
- Sharpie® felt-tip pen (available in bookstore, not required)
- calculator (required – no cell phone use in lab.)
- Bring laptop/tablet to lab to complete quizzes and exams. If you don't have access to one, you can use the limited number of computers available in the Learning Center in Chem 107. A better option to contact Mansfield Library to borrow one for the semester.

CHMY124 – Spring 2022

Moodle

The class Moodle site will be used to post any supplementary material for labs, Spectroscopy data, to host your pre-lab quizzes, and any exam study guides.

Student Conduct

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 University of Montana Student Conduct Code is available at <http://www.umt.edu/SA/VPSA/indec.cfm/page/1321>.

Most CHMY124 students are honest and responsible. I enforce the Student Conduct Code in order to protect the honest students from academic misconduct. One form of academic misconduct that sometimes trips students up is plagiarism. Plagiarism means representing someone else's work as your own and independent contribution. This could be the work of another student or – more commonly - copying and pasting material from the internet without acknowledgement to “save time”. You must express all of your thoughts in your own words – not those of someone else. While we want you to work through problems with other students, when you go to write your work out on your paper it must be *in your own words*. Electronic submission of duplicate reports by two different students or of a report from a student from a previous semester clearly fall into the category of Student Misconduct and will be treated as a serious breach of the Student Academic Conduct Code.

Disability Modifications

If you have a life condition that impacts your academic performance, please contact me the first week of the semester to arrange accommodations, even if you do not yet have your ODE/DSS letter. If you think you may have a disability adversely affecting your academic performance, please contact ODE, the Office of Disability Equity (Lommasson 154, 243-2243).

Cultural Leave

To receive an authorized absence for a cultural, religious or ceremonial event the student or their advisor must submit a formal written request to the instructor. This must include a brief description (with inclusive dates) of the cultural event or ceremony and the importance of the student's attendance or participation. Authorization for the absence is subject to approval by the instructor. The excused absence or leave may not exceed five academic calendar days (not including weekends or holidays). Students remain responsible for completion or make-up of assignments as defined in the syllabus, at the discretion of the instructor. At no stage may students work unsupervised in the fourth floor labs for safety reason.

CHMY124 – Spring 2022

Grading

TAs grade using a detailed key. If you have any questions about grading, first ask your TA to see if they can explain your grade to you. If you still have questions, you can submit your report to Dr. Martin within one week in order to have it checked. Please include a written explanation (email is fine) of your questions about the grading -and please be specific about the question you feel needs regrading. Labs for regrading will not be accepted after one week.

Grades

Lab Points:	Lab 0: Lab safety and significant figures review–	20 points
	Lab 9A: Safety Data Sheets	6 points
	Lab 1: - Automatic Pipet Practice	-15 points
	Lab 3: pH of Consumer Products	- 20 points
	Lab 4A + 4B: Aspirin Labs	- 20 points
	Lab 5: Pigment Extraction, Chromatography and Visible Light-	20 points
	Lab 6A: Introduction to Plate Readers and Spectroscopy	- 20 points
	Lab 6B: Introduction to Excel and Spectroscopy	- 15 points
	Lab 7A + 7B: Esters - Industrial Scents and Perfume	- 25 points
	Lab 8: -Protein Biochemistry	- 25 points
	Lab 9B: How to use scientific databases	- 14 points
	<u>Lab 10: High Performance Liquid Chromatography (HPLC)</u>	<u>- 15 points</u>
TOTAL:		215 points
Pre-Lab Quizzes:		65 points
Lab Notebook:		5 points
In Lab Open Book exam:		<u>60 points</u>
		345 · total pts

Final grades use the classic 90/80/70/60: A-F grading system. Curving of this grading system is at the discretion of the instructor. However an aggregate grade of 90.00% or above will guarantee you an A- or better, 80.00 % a B- or better, 70.00 % a C- or better.

Explanation of Lab Protocols, Lab Record Keeping and Reports

There are three things you need to write out for each lab.

1. Lab protocols:

The first is a lab protocol. This is most like a recipe. Write out the materials you will need and how you will combine them to do the lab. Writing protocols each week ensures that you have a reasonable understanding of the lab exercise, so that you can work safely and efficiently.

PAY ATTENTION BECAUSE THIS NEXT BIT IS IMPORTANT:

If you do not have a complete protocol ready to be initialed by the TA within the first 5 minutes, you cannot start the lab and you will receive a zero for the exercise.

Here are some guidelines for the protocol:

- It should be hand-written in your lab book in pen.
- It must provide all of the information needed to complete that experiment - other than general lab techniques (such as using balances or volumetric devices). In other words – you could follow your own hand-written directions and properly and accurately finish the lab.
- It must provide information from tables if you need them to complete the experiment (only some of these do)
- It must be in your own words (no scanning or photocopies)
- And last but very much NOT the least - every lab **must include safety notes e.g. “caution must be used when handling strong acids”**. The MOST important thing for each lab – more important than results and more important than grades – is your personal safety. This is a Chemistry lab and – we use chemicals.

2. Lab Notebooks:

The second piece of writing is a general notation of everything in your lab notebook and here is why.... Good record keeping is a critical component of all scientific fields that involve the measurement and recording of physical data. However – as students in the applied professional fields - the importance of permanent record keeping for professional and legal reasons is likely to be something you will encounter very early in your careers. A part of this class includes training in the keeping of legal and accessible records. For this, your notebook (that you collect from the bookstore) includes ruled NUMBERED pages for writing your protocol (the first page) and collecting notes.

A record of observation is a permanent record of your work and includes the DATE on which you collected the data. All your observations must be permanently recorded which means that they must be recorded in ink and not pencil. Your notebook is your PRIMARY record. This means your observations are recorded there first. It is not an acceptable practice to record data on a separate piece of paper and then transfer it to your notebook later “for neatness”. Take your book with you whenever you need to record measurements including weights and volumes. Notebooks should be clear but often contain notes about corrections. Strike through anything you wish to correct and re-write the new answer next to it. This is good record keeping practices. The tidied up version is what is presented in your report.

Your TAs will evaluate your record keeping at the end of the semester. Each lab will have a title, a date, a lab protocol and all observations – including the “that looks weird” ones and especially including any tweaks or adjustments you make to the protocol – recorded in ink. Your lab notebook will also be a place you will permanently affix (i.e. staple) graphs and other similar results that you generate. Finally – add a few sentences in conclusion. This worked because.... (or did not because...). A description of a well maintained notebook can be found on page vx of your lab book.

CHMY124 – Spring 2022

3. Lab Reports:

The third and final piece of writing for your lab is the lab reports. They are just that – reports. They are a summary of your work, your results and include answers to a series of questions designed to test your comprehension of the lab and analysis of your own results. You will transfer your recorded data to the report for submission. Attach all graphs and generated data (data that is worked up and analyzed) with your report. Reports should look neat, be concise, be written in your own work and easily show how well you understood both the lab and the theory behind it.

Due dates are given with the labs. Late penalty of 20% per day will be assessed after the due time. Late penalty also assessed for late protocol, graphs, etc.

Lab Exam:

Keep your lab notebook well maintained, and keep copies of all your reports, along with any useful TA comments they might write down during grading. In the last week of the semester you will be given up to 2 hours to complete an in-lab final exam. The exam is open book. It includes some of the more challenging questions from many of the labs. While the data might be different, if you have a well-organized notebook and copies of all of your labs, you can just look up how to do the question in the relevant lab! It is definitely in your best interest to spend time with the TAs going over anything you didn't understand in your lab report!!

CHMY124 Schedule SPRING 2022

Week of: Experiment

January 17-21 NO LABS THIS WEEK

January 24-28 THIS WEEK ONLY Pre-Lab Quiz will be done IN LAB with your TA's to help you (if you have problems – not with the questions!!).

Lab 0: Safety Issues, Lab Walk Around, Safety Data Sheet and Significant Figures
DRY-LAB - Computer/Laptop and calculator required (no lab protocol)

Prelab Quizzes are available from NOON-1PM on MONDAY from for everyone from this week onward. This is your enrolled 124 R00 class and is mandatory. Do not forget!!! ***

Jan 31- Feb 4 **Lab Locker/Equipment Check in**

Experiment 1: Automatic Pipet Practice

Goggles and Laboratory notebook required from this week onwards.

Computer/Laptop required every week.

Feb 7-11 Experiment 3: pH and Consumer Products

Note – there is no Lab 2 (Density and Intro to Excel) this semester

CHMY124 – Spring 2022

- Feb 14 - 18 Experiment 4A: Synthesis, and Purification of Aspirin Part 1.
- Feb 21-25 **Due to the President's Day Holiday prelab will be open From Noon Monday until 9 AM Tuesday**
Experiment 4B: Analysis of Aspirin (Part 2)
- Feb 28-Mar 4 Experiment 5: Pigment Extraction, Chromatography and Visible Light. Intro to Excel.
- Mar 7-11 Experiment 6A: Introduction to Plate Readers and Absorption Spectra of Plant Pigments PART A
- Mar 14- 18 Experiment 6B: Absorption Spectra of Plant Pigments and Intro to Excel PART B
- MAR 21-25 SPRING BREAK. No Classes. Lab Closed.
- Mar 28 – Apr 1 Experiment 7A: Esters – Industrial Scents and Perfumes: Synthesis of Esters Part A
- Apr 4-8 Experiment 7B: Esters – Industrial Scents and Perfumes: Purification of Esters Part B
- Apr 11 -15 Experiment 8: Protein Biochemistry and Advanced Excel
- April 18-22 Experiment 9: Life Sciences Databases ****AND****
Experiment 10: HPLC Analysis of Aspirin (no lab protocol)
- April 25- 29 Experiment 9: Life Sciences Databases ****AND****
Experiment 10: HPLC Analysis of Aspirin (no lab protocol)
- May 2-6 IN-LAB EXAM (Open book – bring your lab reports and lab notebooks)
Clean up and **Lab Locker Checkout.**

NO EXTRA FINAL EXAM FOR CHMY124