

Biochemistry II Laboratory (CHEM 320)

Spring 2020

Instructor: Kelli M. Slunt
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Office Hours: 11:00 am – 11:50 am M, W (Jepson 437) 9:00 am – 10:00 am W (Jepson 437)
10:00 am – 11:00 am W, F (Jepson 437)
and by appointment through EAB (Guide or Campus)
<https://umw.campus.eab.com/>

Office hours are subject to change – when possible, changes will be announced in advance.

Laboratory 9:30 am – 12:15 pm T, Jepson 416
Meeting Time Note: I will be available starting at 8 am in the laboratory due to a time conflict with another course for several students. If you wish to start early, you may begin lab at 8 am. I will complete safety and introductory lecture information at 8 am and again at 9:30 am.

Course Materials (required)

- Slunt, K. Biochemistry Laboratory Manual, Kendall Hunt Publishing, 2009
- Approved laboratory goggles and laboratory coat
- Laboratory notebook with carbonless duplication
- Blue or black ink pen and a Sharpie or glass marking pen
- Calculator with scientific notation
- Access to internet and UMW library

Course Description

This laboratory course (along with CHEM 319) is designed to demonstrate and teach the techniques utilized in the biochemical sciences. This semester will focus on experiments involving identification of carbohydrates, partial purification of biological materials, chromatography, enzyme kinetics, and DNA manipulation.

After completing the course, a student should be able to

- Build on the initial laboratory skills developed in CHEM 319
- Conduct experiments on isolation and characterization of biological mixtures
- Design and conduct a biochemical experiment
- Work with peers to conduct biochemical investigations

The course is designated as writing intensive. It is important that students learn to communicate in written fashion such that peers in the field can understand the scientific findings and conclusions addressed in the paper. In the course assignments, you will be expected to communicate in the same style used by biochemists in industry, academic, or government settings.

Expectations of Students

- 1) Students may not work on experiments outside of laboratory time (8:00 am – 12:15 pm Tuesdays) without the explicit permission of the instructor and may not work in the laboratory alone.
- 2) You will work in groups to collect data. Each student is required to individually complete the data analysis as well as any written assignment for the course. You may consult the literature or Dr. Slunt, but you may not seek assistance from any other faculty member (including other disciplines) or student. Details of these assignments follow in this syllabus.
- 3) Besides unknown samples and any solutions already prepared and available, the students will prepare all solutions themselves. You will need to include descriptions of how the solutions will be prepared, amounts needed, etc. in your pre-laboratory plan.

Attendance

Attendance in the laboratory is mandatory. Excused/make-up laboratories will only be arranged for exceedingly unavoidable circumstances that are documented (death in family, hospitalization, graduate school, professional school or job interview, athletic competition, disability related absence accommodation, etc.). For obligations that are not of an emergent nature, a make-up experiment time must be scheduled at least one week in advance of the scheduled quiz or exam. In the case of emergency, you need to notify Dr. Slunt as soon as possible about the emergency. It is at the discretion of the instructor (with consultation of the chair) to schedule or allow any make-ups. Absences without appropriate documentation do not qualify and will result in an unexcused absence. **Unexcused absences from laboratory cannot be made up. MORE THAN ONE UNEXCUSED LABORATORY ABSENCE WILL RESULT IN FAILURE OF THE COURSE.**

It is also imperative that you be on time for the laboratory. The pre-lab lectures cover important safety and procedural information. If an individual is repeatedly tardy, a **five-point deduction** will occur for each instance or the student will not be permitted to perform the experiment.

It is absolutely critical that you respect the dangers inherent in laboratory space. **If I feel your behavior is seriously unsafe to either you or your classmates, you will be asked to leave immediately and will receive a zero for that day's effort.**

Be sure to bring the laboratory manual, scientific duplication notebook, a blue or black pen, and calculator to each experiment. You are required to have goggles and laboratory coats for each experiment. Failure to bring the appropriate materials to the laboratory may result in a penalty to your grade or may result in you being asked to leave and receiving a zero for that day.

Group Work

Research is often collaborative with individuals contributing to different parts of the overall effort. To maximize success on the experiments and to mimic the collaborative nature of research you will be working in pairs to complete the experiments. The groups will be assigned by Dr. Slunt and will rotate throughout the semester. Many of the experiments have multiple parts and will take the entire laboratory period. In order to be successful, you will need to plan ways to delegate the parts of the experiment.

The collaborative nature of the course extends only to the experimental work. You will work with your partner to carry out the procedures and collect the data. Students must analyze the data individually and write an independent laboratory report

Grading

The grade in the course will be based on the number of points accrued throughout the term.

<u>Grade Component</u>	<u>Points</u>
Pre-laboratory notebook pages (9, 15 points each)	135
Pre-laboratory questions (variable number per experiment, 5 points each)	70
Abstracts (3, 25 points each)	75
Post-laboratory questions, data analysis, notebook (variable per experiment)	120
Experiment 20 report drafts (3, 15 points each)	45
Experiment 20 overall report	300
Supply list and Proposal for Experiment 20 Extension	55
Final Paper for Experiment 20 Extension	200
Total possible points for course	1000

The tentative dates for the assignments are given on the schedule.

The final grade in the course will be calculated out of 1000 points and will be based on the following point scale:

Points accrued	Letter grade	Points accrued	Letter grade
≥ 930 points	A	769-730 points	C
929-900 points	A-	729-700 points	C-
899-870 points	B+	699-670 points	D+
869-830 points	B	669-600 points	D
829-800 points	B-	≤ 599 points	F
799-770 points	C+		

A mid-semester report of unsatisfactory (U) will be reported if you have a C or below in the course thus far.

Any student who fails to submit the final paper for the revised experiment 20 will automatically receive an "F" in the course.

The departmental policy for incomplete grades can be found on the chemistry department website, <http://cas.umw.edu/chemistry/academic-procedures/>.

Scientific Data Handling

Science laboratory courses can take one of two paths; 1) the class completes experiments that have a “correct” answer that the instructor knows and expects the students to obtain or 2) the class involves experiments similar to scientific research in which there is some uncertainty about the “correct” answer. In scientific research, individuals explore a problem and may have some idea about the answer but seek to gain new knowledge through exploration. In this course, you will be completing experiments that have a fairly expected outcome but you still need to treat the experiments like research experiments. Be careful when reporting your data and interpreting your findings that you report what you did and observed rather than what you expected to see or thought would happen. As such, a “wrong” answer in this course is one in which your explanations contradict the data obtained or do not logically explain the collected data. Scientific fraud occurs when individuals report what they expected or thought they would observe rather than what actually occurred.

Another ethical issue is to properly cite the sources of information. Properly cite all sources of information that you use in conducting an experiment (including all methods used) or interpreting the results. Use the American Chemical Society Style Guide as reference for the proper citation of sources.

Assignments - For all experiments except for experiment 20 (Myoglobin experiment), you will be required to submit the following:

- 1) Pre-laboratory notebook page(s) – the following assignment should be completed in the carbonless notebook pages and a copy of these pages are due at the start of the laboratory NOTE – if you do not turn in the notebook pre-laboratory assignment at the start of the laboratory period you will not complete the lab and it will count as an unexcused absence. For a multi-week experiment, you will submit pre-laboratory notebook pages each week.

The pre-laboratory pages should include

- a title of the experiment – in your own words
- a purpose for the experiment – briefly summarize in your own words the procedure/goal – should not exceed two or three sentences – for a multi-week experiment write the purpose for the week.
- a reference for the experiment
- a list of technique(s) you will use in the experiment. Include with the list, a reference to technique(s) in the lab manual as well as notes about using the technique (for example – do you need solutions, how do you prepare a gel, etc.).
- a list of solutions that you need to prepare and information on how to prepare them
- procedural flowchart or outline – the flowchart should be no more than one page. The

flowchart should provide a summary of the experiment to be performed. Do not rewrite the procedure from the experimental handout. This is your opportunity to think about what you will be doing and rewrite it in a way that covers the steps in a simplified manner. The flowchart/outline should indicate the division of labor for each member of the group.

- answers to pre-laboratory questions (can be attached on other paper or uploaded into Canvas) with a works cited list

2) Notebook pages for the experiment should follow the guidelines in the laboratory manual (chapter 1). You will turn in the duplicate pages of your notebook at the start of the next laboratory experiment.

Your notebook pages should meet all of the guidelines in the laboratory manual and include the following:

- date
- notes about any changes in the procedure completed
- data and observations
- complete data analysis – calculations when appropriate – if chart, graphs, excel is used a reference to these programs should be indicated in the notebook and a hardcopy of the appropriate graphs are attached to the copy of the notebook pages
- answer to questions in the laboratory manual (can be attached on other paper) with a works cited list

3) Abstract– after each experiment you will write an abstract for the experiment. This abstract should follow the guidelines posted on *Canvas* from the author guide for the journal *Biochemistry* and the information provided in the ACS webinar on abstracts. Your abstract must be typed on a page that contains the title of the experiment, your name, and an image or photo related to the experiment. The abstract will not exceed 250 words. Your abstracts should be well written to be read by another chemistry student or faculty member who did not complete the experiment. The abstract should not contain undefined abbreviations or literature citations. Your abstract should contain the following sections: background/purpose, methods, results and conclusions. The information should not be plagiarized from the materials in the lab handouts, lab manual, or literature papers. The background/purpose is a statement about why you performed the experiment. The method statement is a brief summary (not step but step) of what you did in the lab. The results should be a meaningful explanation about what you discovered in the experiment. It should not be a statement of data without a discussion of the significance of the findings. Your abstract must be submitted through the assignment portion of Canvas.

Experiment 20 Assignments

1) Pre-lab notebook pages (see details above)

2) Notebook pages (see details above)

3) Formal laboratory report. Each week, you will write the report for the experiment completed to date. Once received, Dr. Slunt will review the submitted report and make suggestions for improvement. The following week, you will incorporate the changes and add the next week's material into the report. By the end of the fourth week, you will have received several weeks of feedback and will finalize the report and add an abstract. You will turn in notebook pages each week but will not be required to answer the post-lab questions for a grade. The formal report should follow the templates for general use (not the one for rapid reports) posted on the *Biochemistry* journal website. All drafts of the report should be submitted through Canvas.

Final Report/Experiment

At the end of the semester, you will be given the opportunity to repeat or revise a portion of experiment 20. Your final report – due by **8:30 am on April 28, 2020** – will be a revised formal laboratory report for experiment 20 incorporating feedback from the previous experiment 20 report.

Due Dates and Extensions

The tentative schedule lists all due dates. All assignments are due by 9:30 am. Late assignments will receive a grade of zero. Each student is allowed a one-week extension on **one** set of post-lab assignments provided that the student has submitted a written request for the extension. The extension does not apply to pre-lab assignments or the final paper. The week following the extension, the student is expected to complete both week's assignments. If the extension occurs during experiment 20 will not receive feedback for the week of the extension.

Honor System

Although you will be working as groups to complete the experiments, all assignments must be completed individually. Alteration of data or copying data from another individual is an honor offense. You may discuss how to do the calculations with other students or get help from the instructor, but your final report must be your own work. Properly cite all sources of information that you use in conducting an experiment (including all methods used) or interpreting the results. Use the American Chemical Society Style Guide as reference for the proper citation of sources.

You may not collaborate on the data analysis, pre-laboratory assignments, or notebook write-ups. Any assignment for which you will receive a grade must be completed individually and pledged as your own work. This includes notebook pages, laboratory reports, etc.

In accordance with the University's Honor Code, all work submitted for grading must be your own and be pledged as such by writing at the end of the work, "I hereby declare upon my word of honor that I have neither given nor received any unauthorized help on this work. (your signature)" It is your duty as students and ours as faculty to uphold the Honor Code, which is described in detail in the [Guidebook & Constitution](#). Suspected violations of the Honor Code will be addressed according to the policy established by the Honor Council.

Disability Resources Statement

Students who require or feel they may require accommodations due to a disability should visit the Office of Disability Resources online (<http://academics.umw.edu/disability/>) for information about available resources. You will need to request appropriate accommodations through this office as soon as possible and then make an appointment to see your instructor to discuss your approved accommodation needs (you will need the letter issued you by the office at this meeting). If you have allergies to any chemicals or other emergency medical information, or have any other special needs, please notify your instructor ASAP.

Title IX Compliance Statement

University of Mary Washington faculty are committed to supporting students and upholding the University's *Policy on Sexual and Gender Based Harassment and Other Forms of Interpersonal Violence*. Under Title IX and this Policy, discrimination based upon sex or gender is prohibited. If you experience an incident of sex or gender based discrimination, we encourage you to report it. ***While you may talk to your instructor, understand that as a "Responsible Employee" of the University, they must report to UMW's Title IX Coordinator what you share.*** If you wish to speak to someone confidentially, please contact the below confidential resources. They can connect you with support services and help you explore your options. You may also seek assistance from UMW's Title IX Coordinator. Please visit <http://diversity.umw.edu/title-ix/> to view UMW's *Policy on Sexual and Gender Based Harassment and Other Forms of Interpersonal Violence* and to find further information on support and resources.

Classroom Recording Statement

Classroom activities in this course may be recorded by students enrolled in the course for the personal, educational use of that student or for all students presently enrolled in the class only, and may not be further copied, distributed, published or otherwise used for any other purpose without the express written consent of the course instructor. All students are advised that classroom activities may be taped by students for this purpose. Distribution or sale of class recordings is prohibited without the written permission of the instructor and other students who are recorded. **Distribution without permission is a violation of copyright law.** This policy is consistent with UMW's [Policy on Recording Class and Distribution of Course Materials](#).

Tentative Laboratory Schedule

Date	Laboratory Topic	Assignment due at 9:30 am
1/14	Course Introduction	No assignment due
1/21	Experiment 8 – Identification of Carbohydrates	Pre-lab notebook pages and answers to pre-lab questions for Exp. 8
1/28	Experiment 22 – Separation and Identification of Fatty Acids in Commercial Oils	Abstract and post-lab questions for Exp. 8 and pre-lab notebook pages and answers to pre-lab questions for Exp. 22
2/4	Experiment 20 – Isolation and Characterization of Myoglobin from Hamburger Week 1 – Isolation of Crude Mb and Investigation of Redox Properties	Abstract and post-lab questions for Exp 22 and pre-lab notebook pages for week 1 of Exp 20 (no pre-lab questions this week)
2/11	Experiment 20 – Isolation and Characterization of Myoglobin from Hamburger Week 2 – partial purification by ion exchange and gel permeation chromatography	First draft of formal report for Experiment 20 – contains introduction, materials and methods, results and discussion for the week 1 experiments and pre-lab notebook pages for week 2 of Exp 20 and answers to pre-lab questions 2 and 3
2/18	Experiment 20 – Isolation and Characterization of Myoglobin from Hamburger Week 3 – SDS-PAGE and protein concentration determination of crude and partially purified Mb and first part of the ligand binding to Mb (instructions posted on Canvas)	Second draft of formal report for Experiment 20 – contains introduction, materials and methods, results and discussion for the weeks 1 and 2 experiments and pre-lab notebook pages for week 3 of Exp 20 and answer to pre-lab question 1
2/25	Experiment 20 – Isolation and Characterization of Myoglobin from Hamburger Week 4 –Ligand binding to Mb (instructions posted on Canvas)	Third draft of formal report for Experiment 20 – contains introduction, materials and methods, results and discussion for the weeks 1-3 experiments and pre-lab notebook pages for week 4 of Exp 20
3/3	<i>Spring Break</i>	

Date	Laboratory Topic	Assignment due at 8 am
3/10	Experiment 9 – NMR Spectroscopy of Biological Molecules (pen and pencil exercise) – you will not be conducting the actual experiment so no need to write a pre-lab notebook pages or an abstract at the end of the experiment	Final draft of formal report for Experiment 20 – contains abstract, introduction, materials and methods, results and discussion, and conclusion for the entire experiment and answers to the pre-lab questions for Exp 9.
3/17	Experiment 16 – Salting Out Proteins – Week 1 – Precipitation of proteins and desalting of samples	Post-lab questions for Exp 9 and pre-lab notebook pages for week 1 of Exp 16 and answers to pre-lab questions for Exp 16
3/24	Experiment 16 – Salting Out Proteins – Week 2 – Protein Concentration determination of protein samples	Pre-lab notebook pages for week 2 of Exp 16
3/31	Experiment 16 – Salting Out Proteins – SDS-PAGE of protein samples	pre-lab notebook pages for week 3 of Exp 16 – no pre-lab questions
4/7	Experiment 20 extension	Supply list for project due by 4/1/20 at 11 am Abstract and post-lab questions for Exp. 16, proposal for experiment 20 extension – due on 4/7/20 at 8 am
4/14	Experiment 20 extension	
4/21	Experiment 20 extension	
4/28	FINAL EXAM WEEK	Final Paper for Exp20 Extension and Notebook pages due by 8:30 am – upload final paper to Canvas and turn in notebook pages to Dr. Slunt's Jepson office or mailbox