

# University of Mary Washington

Department of Chemistry

## **CHEM 471H: Advanced Topics in Chemistry: Bioanalytical Chemistry**

Spring 2020

Section 1

Instructor: Dr. Randall D. Reif  
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Office Hours: Monday 2:00-4:00 PM  
Thursday 1:30-3:30 PM  
Friday 2:00-3:00 PM  
Other times by appointment.  
I also have an open door policy-drop by anytime my door is open!

Class Times: Lecture: M, W, F 10:00 – 10:50 AM Jepson 454

### Required Course Materials:

- 1.) Calculator with scientific notation and exponential functions; you will only be able to use non-graphing calculators on all quizzes and exams. The TI-30X series calculators are recommended (available at the book store), but you can also use the department's Casio FX260 calculators.
- 2.) Access to Canvas: This course will make use of the Canvas Course management system. Please check here frequently as materials posted will include course announcements, assignments, and other course materials as necessary.
- 3.) *Recommended:* A laptop, tablet, or other internet accessible device for in-class activities

### Course Prerequisites

Permission of Instructor is required but the recommendation is either/both of Biochemistry I (Chem 317) or Chemical Analysis II (Chem 254).

### Course Description

Bioanalytical Chemistry is designed to provide an understanding about the chemical analysis techniques commonly utilized in biochemistry and biology. This course will focus on the analytical techniques used to analyze, quantify, or determine the structures of different biological macromolecules, small molecules, and metabolites.

### Learning Outcomes

This course will:

1. Help students gain an understanding of basic analytical techniques used in bioanalytical chemistry and the chemical principles involved in them
2. Enhance student ability to communicate chemical concepts both in writing and through oral presentations

3. Enhance student ability to find, interpret, and communicate peer reviewed original research
4. Prepare students for advanced study in graduate/professional school or employment in a chemistry-related field
5. Enhance student ability to interpret and solve chemical problems (critical thinking skills)

## Grading

The grade in the course will be based on the number of points accrued throughout the semester. Each assignment is worth a specific percentage of the final grade, shown below. The dates for the assignments will be announced in class or are listed on the tentative schedule.

<b>Grade component</b>	<b>Total %</b>
Engaged Participation	15%
Quizzes and Assignments	15%
Oral Presentations	15%
Writing Assignments (including revisions)	30%
Literature Review Project	25%
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Total possible	100%

The final course grade will be based on the following point scale:

<b>Points accrued</b>	<b>Letter grade</b>	<b>Points accrued</b>	<b>Letter grade</b>
≥ 93 %	A	76.9-73.0 %	C
92.9-90.0 %	A-	72.9-70.0 %	C-
89.9-87.0 %	B+	69.9-67.0 %	D+
86.9-83.0 %	B	66.9-60.0 %	D
82.9-80.0 %	B-	≤ 59.9 %	F
79.9-77.0 %	C+		

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

### **Writing Assignments**

These assignments will include such assignments as small writings about readings, annotations of papers, library research method write-ups over bioanalytical topics and assigned readings, as well as drafts of a longer ~15 page review article on a Bioanalytical technique. Both drafts and revised work will be assessed.

In addition, several times throughout the semester, a detailed summary of a bioanalytical paper will be turned in along with the FIRST PAGE of the article. Articles should come from a peer-reviewed, primary literature source such as *Analytical Chemistry* or *Biochemistry*. Many Journals can be found from the ACS at <http://pubs.acs.org>

### **Quizzes and Assignments**

Performing homework is a responsibility of all students and is one of the best ways to prepare for quizzes/exams and develop an understanding of the material. Problems will be assigned in class. Along with example problems from lecture, other problems can be found in textbooks related to analytical chemistry or biochemistry. These are representative of questions you can expect on

exams. The answer key is available in my office, and you should feel free to drop by at office hours or other times (as long as you know I'll be there) to check your work.

Quizzes will serve as a reinforcement of material covered during that week of class and can be announced or unannounced. Additionally, there will be literature quizzes given a specific times during the semester. The average quiz score will combined with the homework score and account for 15% of the final grade. No make-up quizzes will be offered. Quizzes will be given in class.

### **Oral Presentations**

You will give both brief (~2 minute) and longer oral presentations (5 - 15 minutes). Some will be formal including the use of visuals (such as PowerPoint), while others will be extemporaneous.

### **Class Participation**

The learning environment in every class is set by the students and the instructor. It is crucial for the success of this course that all students participate in activities and class discussions. There will be many different forms of participation and students are expected to remain actively engaged while in class. The use of technology is requested for some activities, but otherwise, should be put away unless being used directly for a class activity.

### **Literature Review Project**

The final exam for the course will be in the form of a Bioanalytical Literature Review about a bioanalytical technique of your choice. The Literature Review Project will consist of BOTH an oral presentation (10-12 mins) as well as a ~15 page, double-spaced written literature review paper. More information about the project will be presented in class throughout the semester.

### Contact

**Each student must regularly check their UMW e-mail address as well as CANVAS.**

Announcements and assignments will be made or posted via email or on Canvas. In addition all students are required to **check Canvas** regularly, as this is where we will post class related material including readings.

### Inclusive Learning

I feel strongly that the classroom and laboratory should be inclusive environments where People from different backgrounds, temperaments, experiences, and life circumstance can all participate in shared learning. Listening, respectfulness, and civility are cornerstones of inclusive learning and will be expected from everyone.

### Disability Resources

The Office of Disability Services has been designated by the University as the primary office to guide, counsel, and assist students with disabilities. If you receive services through that office and require accommodations for this class, please make an appointment with me as soon as possible to discuss your approved accommodation needs. Bring your accommodation letter with you to the appointment. I will hold any information you share with me in the strictest confidence unless you give me permission to do otherwise. Any student with particular needs should

contact the Office of Disability Resources; 401 Lee Hall or at 540-654-1266. They will require appropriate documentation of a disability.

## Title IX

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 me, understand that as a "Responsible Employee" of the University, I 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.

### **Resources**

-Stefanie Lucas-Waverly  
Title IX Coordinator  
540-654-5656  
slucaswa@umw.edu  
-Crystal Rawls  
Title IX Deputy for Students  
Area Coordinator  
540-654-1801  
crawls@umw.edu

### **Confidential Resources**

-Talley Center for Counselling Services  
LeeHall 106  
-Student Health Center  
Lee Hall 112  
-Empowerhouse  
540-373-9373  
-RCASA  
540-371-1666

## Course Recording Policy

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use. Students who wish to record lectures or class activities for study purposes must inform the faculty member first. Students with approved accommodations from the Office of Disability Resources permitting the recording of class meetings must present the accommodation letter to the instructor in advance of any recording being done. On any days when classes will be recorded, the instructor will notify all students in advance. 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 educational privacy law. This policy is consistent with UMW's Policy on Recording Class and Distribution of Course Materials.

## Emergency Procedures

***Contacts in the Event of an Emergency:***  
***Emergency Number: 4444 (from any UMW phone)***  
***Campus Police (From a cell phone): (540) 654-4444/1025***

In the event of fire, fire alarm activation or release of hazardous materials:

- Immediately leave the building and assemble in designated assembly point.
- **Do not re-enter the building or leave the assembly site until advised for any reason.**

In the event of Severe Weather or Natural Disaster's:

- Remain inside the building. Do not enter a building during an earthquake.
- Practice **Drop** to ground, **Cover** head and neck, and **Hold on** to shelter for earthquakes.

In the event of Critical Stress Situations (Violence, Active Shooter):

- Practice **Run, Hide, Fight.**
- **Run** or escape from building
- **Hide** if not possible to escape.
- **Fight** as a last resort.

Weather Policy

To determine if classes will be held during inclement weather check the school website or call campus safety. If the campus is closed due to weather or other conditions on a day when an exam is scheduled, the exam will take place during the next class period when campus is open. If an assignment is due in class on a day when campus is closed due to weather or other conditions, it will be due at the next scheduled class meeting.

Honor System

Any assignment for which you will receive a grade (unless designated as a group assignment) must be completed and pledged as your own work. The honor pledge must be written in full: *I hereby declare upon my word of honor that I have neither given nor received unauthorized help on this work. (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. I will not grade an assignment without a signed pledge.



## Tentative Daily Schedule

**Note: Topics, Dates and Assignments are Subject to Change. Please Check Canvas for most up to date information.**

<u>Date</u>	<u>Topic</u>	<u>Assignment</u>
Jan. 13	Syllabus and Course overview	
Jan. 15	Biochemistry Crash course/Review	
Jan. 17	Biochemistry Review and Literature Types	<i>Primary Literature Example</i>
Jan. 20	MLK, Jr. Day – NO CLASS	
Jan. 22	Analytical Basics- Figures of Merit	
Jan. 24	Calibration Methods	
Jan. 27	Searching for Chemical Literature	<i>Quiz 1</i>
Jan. 29	Reading Chemical Literature	<i>Literature Reading Reflection</i>
Jan. 31	Bioanalytical Review Topic Discussion	<b><i>Bioanalytical Topic of Interest</i></b>
Feb. 3	Spectroscopy	
Feb. 5	Spectroscopy	
Feb. 7	<b>Review Topic Pitch Presentation</b>	<b><i>Topic Presentation</i></b>
Feb. 10	ELISA	
Feb. 12	ELISA and Annotation activity	<i>Article Summary 1 + Full article to class</i>
Feb. 14	Review Literature Paper Analysis Activity	<i>Bring 3 papers on your topic to class</i>
Feb. 17	Polymerase Chain Reaction (PCR)	
Feb. 19	qRT-PCR	
Feb. 21	Fluorescence Microscopy	<b><i>Annotated Bibliography v1</i></b>
Feb. 24	Fluorescence Microscopy	<i>Article Summary 2</i>
Feb. 26	Literature Quiz and Separations	<i>Literature Quiz 1</i>
Feb. 28	Separations	
Mar. 2	Spring Break, NO CLASS	
Mar. 4	Spring Break, NO CLASS	
Mar. 6	Spring Break, NO CLASS	
Mar. 9	Separations	
Mar. 11	Electrophoresis Introduction	
Mar. 13	Gel Electrophoresis	<b><i>Literature Review Outline</i></b>
Mar. 16	Blotting Techniques Research Day	
Mar. 18	Blotting Presentations (Western, Northern, Southern)	<b><i>Group Blotting Presentation</i></b>
Mar. 20	Blotting Reflections	<i>Article Summary 3</i>
Mar. 23	Chromatography	
Mar. 25	Gas Chromatography (GC)	
Mar. 27	Mass Spectrometry	<b><i>Annotated Bibliography v2</i></b>
Mar. 30	<b>Literature Article Presentations</b>	
Apr. 1	<b>Literature Article Presentations</b>	
Apr. 3	GC-MS	<b><i>Literature Review Draft</i></b>
Apr. 6	HPLC	
Apr. 8	HPLC-MS	<i>Literature Quiz 2</i>
Apr. 10	Student Selected Topic	<i>Article Summary 4</i>
Apr. 13	<b>Literature Review Presentations</b>	
Apr. 15	<b>Literature Review Presentations</b>	
Apr. 17	<b>Literature Review Presentations</b>	
Apr. 20	<b>Literature Review Presentations</b>	
Apr. 22	<b>Literature Review Presentations</b>	
Apr. 24	Wrap-up and Evaluations	
Apr. 27	FINAL EXAM: 8:30-11:00am	<b><i>Final Literature Review Paper</i></b>

Color Code Key:

**Red** = Oral Presentations

**Blue** = Writing Assignments

**Green** = Quizzes and Assignments

**Bold** = Component of Final Literature Review