

Biochemistry and Molecular Biology Assessment Plan

Biochemistry and Molecular Biology Program Mission Statement

The biochemistry and molecular biology major fills a unique niche that interconnects the biology and chemistry curriculum. While in this program, students develop a strong knowledge of the biochemical sciences and develop a variety of professional skills including being able to think critically, to communicate effectively, and to understand the importance of collaborating with peers while conducting science. This in turn prepares them for advanced study in graduate school and a variety of careers.

Biochemistry and Molecular Biology Program Goals

1. Provide students with background knowledge and technical skills needed for the biochemical sciences.
2. Engage students in the process of conducting science – planning, executing, and evaluating. Students will also learn how to apply primary literature in the process of conducting science.
3. Challenge students to think critically and quantitatively in evaluating data and to apply that skill to issues arising in the world around them, including ethical conflicts surrounding scientific theories, technologies, or applications.
4. Aid students in developing strong oral and written communication skills to convey scientific work in a clear, coherent manner.
5. Expose students to the importance of diversity in the practice of science through collaborative learning where different perspectives are valued and evaluated.

Alignment of Biochemistry and Molecular Biology Learning Goals with the Wells College's Student Goals

	Biochemistry and Molecular Biology Learning Goals				
Wells APG	1	2	3	4	5
Content 1	✓		✓		
Content 2	✓				
Content 3		✓	✓	✓	
Skills 1		✓	✓		
Skills 2		✓	✓		
Skills 3			✓		✓
Skills 4		✓	✓		
Skills 5		✓		✓	✓
Skills 6		✓	✓		✓

Program Goals, Learning Objectives and Measurable Outcomes

1. **Program Goal:** Provide students with background knowledge and technical skills needed for the biochemical sciences.
 - A. **Learning Objective:** Students will be able to demonstrate an understanding of major principles in molecular biology and biochemistry.
 - B. **Learning Objective:** Students will have a foundation in the technological skills used in biochemistry and molecular biology.

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2. **Program Goal:** Engage students in the process of conducting science – planning, executing, and evaluating. Students will also learn how to apply primary literature in the process of conducting science.
 - A. **Learning Objective:** Students will be able to independently design and carry out an experimental research project.
 - B. **Learning Objective:** Students will understand how to review, utilize, and incorporate primary literature in their research projects.
3. **Program Goal:** Challenge students to think critically and quantitatively in evaluating data and to apply that skill to address issues arising in the world around them.
 - A. **Learning Objective:** Students will be able to evaluate and critically analyze data they collect in the lab to formulate conclusions and ideas for future studies.
 - B. **Learning Objective:** Students will be able to evaluate and critically analyze results presented by others and utilize the information in discussions, in projects, and to further their understanding of the biochemical sciences.
4. **Program Goal:** Aid students in developing strong oral and written communication skills to convey scientific work in a clear, coherent manner.
 - A. **Learning Objective:** Students in the biochemistry and molecular biology program will learn how to organize their data and present their results in written form consistent to what is expected in the professional field.
 - B. **Learning Objective:** Students in the biochemistry and molecular biology program will develop oral presentation skills to discuss research results, deliver professional talks, and convey their ideas through poster presentations.
5. **Program Goal:** Expose students to the importance of diversity in the practice of science through collaborative learning where different perspectives are valued and evaluated.
 - A. **Learning Objective:** Students will be able to work in a group setting to achieve a common goal. This includes providing peers with feedback and constructive comments.
 - B. **Learning Objective:** Students learn how to reach out and communicate with people outside of Wells college. This will include professionals in the field and members of the community.

How Assessment Data Will Be Utilized

Student work will be collected throughout the academic year by the faculty member teaching the courses. Each faculty member will evaluate if students learned what was expected, based on each measurable outcome utilized. Percentages of how well the students answered/ completed the activity will be calculated, and coverage of learning objective will be considered proficient if 70% or more of the class demonstrated a passing grade on the assessed activity. Throughout the year, the biochemistry and molecular biology faculty will assess the progress in each of their classes and adjust meet the learning needs of the students.

Goal 1: Provide students with background knowledge and technical skills needed for the biochemical sciences.

<i>Objective</i>	<i>Outcome</i>	<i>Measure</i>	<i>Measurement Tool</i>	<i>Success Criteria</i>	<i>Data Location</i>
A. Students will be able to demonstrate an understanding of major principles in molecular biology and biochemistry.	1. Build a foundation of background knowledge in molecular biology and biochemistry	Exams (Final Exams in CHEM 213L, CHEM 214L, CHEM 323L, CHEM 326, and CHEM 303)	Answer Keys	overall student proficiency will be considered met if 70% of the students demonstrate a passing grade on the assessed activity	Faculty Files
		Lab report (Independent research project in CHEM 214L, CHEM 323L)	Rubric		
	2. Apply the acquired background knowledge to research projects and real world problems	Take-home exams (CHEM 303)	Answer Keys	overall student proficiency will be considered met if 70% of the students demonstrate a passing grade on the assessed activity	Faculty Files
B. Students will have a foundation in the technological skills used in biochemistry and molecular biology.	1. Utilize lab equipment and software needed to collect and analyze data	Post-lab Assignments (CHEM 213L, CHEM 214L, CHEM 323L, BIOL 226L)	Answer Keys to post-lab Assignments	overall student proficiency will be considered met if 70% of the students demonstrate a passing grade on the assessed activity	Faculty Files
		2. Organize and maintain a lab notebook to record findings, analyze data, and become an independent researcher	Open Lab Notebook Exams (CHEM 213L, CHEM 214L, CHEM 323L)		
		Lab Notebook Checklist (CHEM 213L, CHEM 214 L, CHEM 323L)	Checklist		

Goal 2: Engage students in the process of conducting science – planning, executing, and evaluating. Students will also learn how to apply primary literature in the process of conducting science.

<i>Objective</i>	<i>Outcome</i>	<i>Measure</i>	<i>Measurement Tool</i>	<i>Success Criteria</i>	<i>Data Location</i>
A. Students will be able to independently design and carry out an experimental research project.	1. Develop and write out an experimental protocol based on data collected in lab or adapt previously published protocols.	Experimental Protocols (CHEM214L and CHEM323L)	Rubric	overall student proficiency will be considered met if 70% of the students demonstrate a passing grade on the assessed activity	Faculty Files
	2. Utilize a protocol to carry out an experiment, test a hypothesis, and analyze data.	Lab Assignments (BIOL 114L, BIOL 130L, CHEM213L, CHEM214L, CHEM323L)	Answer keys	overall student proficiency will be considered met if 70% of the students demonstrate a passing grade on the assessed activity	Faculty Files
		Lab report (BIOL 130L, Independent research project in CHEM214L, CHEM323L)	Rubric		
B. Students will review, utilize, and incorporate primary literature into research projects.	1. Understand how to read, analyze and use scientific literature while planning and conducting experimental research	Lab report (Independent research project in BIOL 130L, CHEM214L, CHEM323L)	Rubric	overall student proficiency will be considered met if 70% of the students demonstrate a passing grade on the assessed activity	Faculty Files
		Experimental Protocols (CHEM214L and CHEM323L)	Rubric		
	2. Utilize and compile findings in scientific literature based research	Mini Review Article (CHEM326, CHEM303)	Rubric	overall student proficiency will be considered met if 70% of the students demonstrate a passing grade on the assessed activity	Faculty Files
		Lab report (BIOL 130L, Independent research project in CHEM214L, CHEM323L)	Rubric		

Goal 3: Challenge students to think critically and quantitatively in evaluating data. They apply these skills to issues arising in the world around them, including ethical conflicts surrounding scientific theories, technologies, or applications.

<i>Objective</i>	<i>Outcome</i>	<i>Measure</i>	<i>Measurement Tool</i>	<i>Success Criteria</i>	<i>Data Location</i>
A. Students will be able to evaluate and critically analyze data they collect in the lab to formulate conclusions and ideas for future studies.	1. Analyze and evaluate data collected in lab and during independent research.	Post Lab assignments (CHEM213L, CHEM214L and CHEM326)	Answer Keys	overall student proficiency will be considered met if 70% of the students demonstrate a passing grade on the assessed activity	Faculty Files
	2. Use analyzed data to develop protocols and methods for future experiments and projects.	Lab report (BIOL 130L, Independent research project in CHEM214L, CHEM323L)	Rubrics		
B. Students will be able to evaluate and critically analyze results presented by others and utilize the information in discussions, in projects, and to further their understanding of the biochemical sciences.	1. Evaluate data and ideas presented in journal articles and books.	Reflection paper on the book "The Quest for the Cure" CHEM303	Rubric	overall student proficiency will be considered met if 70% of the students demonstrate a passing grade on the assessed activity	Faculty Files
		Exam Questions on Paper discussions CHEM323L	Answer Key		
	2. Critically analyze arguments and ideas presented in podcasts and movies.	Oral presentation on "Quack Drugs" CHEM303	Rubric	overall student proficiency will be considered met if 70% of the students demonstrate a passing grade on the assessed activity	Faculty Files
		Discussion Questions on movie "Extraordinary Measures" CHEM303	Answer Key		

Goal 4: Aid students in developing strong oral and written communication skills to convey scientific work in a clear, coherent manner.

<i>Objective</i>	<i>Outcome</i>	<i>Measure</i>	<i>Measurement Tool</i>	<i>Success Criteria</i>	<i>Data Location</i>
A. Students will learn how to organize their data and present their results in written form consistent to what is expected in the professional field.	1. Experimental results will be organized in formal lab write-ups	Lab reports BIOL 130L, CHEM213L, CHEM214L and CHEM323L	Rubrics	overall student proficiency will be considered met if 70% of the students demonstrate a passing grade on the assessed activity	Faculty Files
	2. Literature research will be organized and presented in mini-review article format.	Mini-review article CHEM326 and CHEM303	Rubrics	overall student proficiency will be considered met if 70% of the students demonstrate a passing grade on the assessed activity	Faculty Files
B. Students will develop oral presentation skills to discuss research results, deliver professional talks, and convey their ideas through poster presentations.	1. Students will discuss experimental results in an oral presentation to be given to their peers.	Oral presentations in CHEM214L and CHEM323L	Rubrics	overall student proficiency will be considered met if 70% of the students demonstrate a passing grade on the assessed activity	Faculty Files
	2. Students will discuss literature based research in an oral presentation to be given to their peers.	Oral Presentations CHEM326L and CHEM303	Rubrics	overall student proficiency will be considered met if 70% of the students demonstrate a passing grade on the assessed activity	Faculty Files
	3. Students will be able to share their ideas and research with people that do not have a background in Biochemistry.	Drug Pamphlet CHEM303	Rubric-feedback on the pamphlet from a reader that does not have a background in Biochemistry	overall student proficiency will be considered met if 70% of the students demonstrate a passing grade on the assessed activity	Faculty Files

Goal 5: Expose students to the importance of diversity in the practice of science through collaborative learning where different perspectives are valued and evaluated.

<i>Objective</i>	<i>Outcome</i>	<i>Measure</i>	<i>Measurement Tool</i>	<i>Success Criteria</i>	<i>Data Location</i>
A. Students will be able to work in a group setting to achieve a common goal. This includes providing peers with feedback and constructive comments.	1. Work together as a group to efficiently conduct research and convey results	Post Lab Assignments (CHEM213L, CHEM214L and CHEM 323L)	Answer key	overall student proficiency will be considered met if 70% of the students demonstrate a passing grade on the assessed activity	Faculty Files
	2. Provide constructive peer feedback on papers, projects, and presentations	Peer feedback form submitted after presentations and projects (CHEM214L, CHEM323L, CHEM326 and CHEM303)	Rubric	overall student proficiency will be considered met if 70% of the students demonstrate a passing grade on the assessed activity	Faculty Files
B. Students learn how to reach out and communicate with people outside of Wells college. This will include professionals in the field and members of the community.	1. Attendance, participation and reflection on relevant colloquium speakers	Paper discussion questions from articles authored by incoming speakers (CHEM323L)	Answer Key	overall student proficiency will be considered met if 70% of the students demonstrate a passing grade on the assessed activity	Faculty Files
	2. Participation in local meetings and poster sessions	Rochester academy of sciences participation BCS403 Internships Assignments (poster presentations, reflective essay) (BCS290 and BCS390)	Rubric	overall student proficiency will be considered met if 100% of the students demonstrate a passing grade on the assessed activity	Faculty Files