

CSM

BS Biochemistry

Student Outcomes Assessment Plan (SOAP)

I. Mission Statement

The mission of the Department of Chemistry is to provide students with the appropriate level of modern and comprehensive chemical education required for life and work in our technologically advanced society. To accomplish this the department offers courses for students planning to be professional chemists, for students planning careers in the medical professions and careers in teaching, for students requiring a basic chemical science background for other majors, and for students fulfilling their general education science requirements.

The Bachelor of Science in Biochemistry is intended for students who plan to pursue a career in biochemical or chemical research, graduate study in biochemistry, or professional education in clinical health professions (e.g. medical, pharmaceutical, or dental).

II. Goals and Student Learning Outcomes

The Department of Chemistry's expectations for student learning are based on the accreditation standards outlined for undergraduate programs in chemistry by the American Chemical Society (ACS) and their curriculum requirements. Each outcome is listed below with details of how they fit into curriculum and the types of activities that may show evidence of student progress in these areas. The goals of the program in Biochemistry are to prepare undergraduate students with the relevant and applicable **knowledge** in the core chemistry and biochemistry areas (i.e. general, analytical, biochemistry, organic, and physical); the **critical thinking skills** and the **technical laboratory skills** in preparation **to contribute to society** and work in the health professions (e.g. medical, pharmaceutical, dental, osteopathy, ophthalmology, and other health-related professions), as skilled biochemists and science researchers, or for entry into graduate degree programs (M.S. or Ph.D.).

- SLO1 Students will apply their understanding of chemical and biochemical terminology, concepts, theories, and skills to solve problems and evaluate the significance of data.
- SLO2 Students will apply their understanding of chemical and biochemical terminology, concepts, theories, and skills to conduct experimental laboratory work of high quality.
- SLO3 Students will identify, find, and use chemical and biochemical information from reference materials and the peer-reviewed literature.
- SLO4 Students will clearly, effectively, and professionally communicate their scientific opinions, understanding and results in common written and oral formats.
- SLO5 Students will function effectively in collaborative and group work environments in lecture, study, and laboratory settings. This often includes the ability to work on a component of a larger project and connect their work with the results and work of other students and reports in the peer-reviewed literature.

III. Curriculum Map (Matrix of Courses X Learning Outcomes)

BS Biochemistry Program Curriculum Map

This table provides information regarding how the outlined student learning outcomes are introduced (I), developed (D), and mastered (M) as students progress through the curriculum.

SLO	1Alec	1Alab	1Blec	1Blab	128A	128B	129A	129B	102	110A	112	155A	155B	156
1	I	I	D	D	D	D	D	D	D	D	M	D	M	M
2		I		D			D	D	D					M
3	I	I	I	I	I	I	I	D	D	D	M	D	M	M
4				I			I	D	D					M
5		I		I			D	D	D			D	M	M

IV. Assessment Methods

Direct Measures

The majority of assessment measures for the BS Biochemistry program take place during the CHEM 156 Biochemical Laboratory Techniques. This course and its independent research project serves as a capstone experience for students in this program.

- A. Biochemistry Exam (SLO1) – This exam will consist of validated multiple choice questions taken from biochemistry test banks. It will be administered to students in CHEM 155B near the end of the course. It is expected that students passing the course will score above 50% correct responses on the exam.
- B. Laboratory Work, Notebook, and Data Review (SLO2, SLO5)- Students will be scored on writing a protocol for describing the steps, reagents, conditions and use of instrumentation for a procedure conducted during CHEM 156 laboratory. A rubric will be used to score the work. It is expected that students passing the course will score above 70% on the assignment. The rubric is calibrated by all biochemistry faculty evaluating ~3-5 works on the protocol assignment, comparing the scores anytime the assignment or rubrics are updated.

- C. Final Group Written Report Rubric (SLO1, SLO3, SLO4) – Students will write a group report on a culminating independent experiment conducted during CHEM156. Student reports will be scored on the ability to accurately report data as compared to notebook data, including a thorough materials and methods section, and including content, integration and critical analysis of their own work in the context of other groups’ results. A rubric will be used to score the work. It is expected that students passing the course will score above 70% on the assignment. The rubric is calibrated by all biochemistry faculty evaluating ~3-5 works on the protocol assignment, comparing the scores anytime the assignment or rubrics are updated.
- D. Oral Presentation Rubric (SLO1, SLO3, SLO4) – A 15 minute oral presentation is given at the end of CHEM 156. The student’s presentation will be scored using the attached oral presentation rubric. The rubric is calibrated by all biochemistry faculty evaluating 3-5 presentations and comparing scores any time instructional faculty, the assignment, or the rubric are updated. It is expected that 70% of students passing the class will have scores of 21 or above.

Indirect Measures

- E. Alumni and Employer Feedback – At least once every five years the department will conduct surveys or focus groups with alumni and their employers using either surveys or focus groups. These mechanisms will allow the department to reevaluate the target student outcomes to match changing needs in the chemistry community.
- F. Graduating Students Feedback – The department will ask for feedback from graduating students using surveys or focus groups to evaluate their perception of whether the degree has adequately prepared them for their chosen career. This may include job placement and graduate/professional school admission rates.
- G. Existing Student Feedback – At least once every five years, the department will hold a focus group with existing biochemistry majors. This will provide an opportunity to identify emerging problems quickly before they show up in tracked data.
- H. Faculty Feedback – The department will periodically collect feedback from permanent and temporary faculty and instructors on their perceptions of student strengths and weaknesses.

V. Student Learning Outcomes X Assessment Methods Matrix

This table provides information regarding how the outlined student learning outcomes will be assessed.

	Direct Measures	Indirect Measures
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	A – Biochemistry Exam	B – Laboratory Work	C – Written Report	D – Oral Presentation	E – Alumni and Employer	F – Graduating Students	G – Current Students	H – Faculty
1	X		X		X	X	X	X
2		X			X	X	X	X
3			X		X	X	X	X
4			X	X	X	X	X	X
5		X	X		X	X	X	X

VI. Timeline for Implementation of Assessment Methods and Summary Evaluations

The assessment timeline is based on the department's external program review cycle, repeating each five to seven years beginning with the year following the completion of the department's self-study.

Data for all direct measures will be collected on an annual basis and stored for future review by the assessment committee. Surveys or focus groups with graduating students will be conducted annually and the data will be stored for future review by the assessment committee. The following timeline outlines the schedule for review of that data by the department assessment committee.

First Year (AY 2015-2016)

- Review of SLO1 – Problem Solving & Data Interpretation using data from methods A,C,F
- Faculty Discussion of Student Outcomes (Method H)

Second Year (AY 2016-2017)

- Review of SLO2 – Laboratory Work using data from methods B,F
- Current Student Survey / Focus Group (Method G)
- Faculty Discussion of Student Outcomes (Method H)

Third Year (AY 2017-2018)

- Review of SLO3 – Literature Skills using data from methods C,F
- Alumni & Employer Survey / Focus Groups (Method E)
- Faculty Discussion of Student Outcomes (Method H)

Fourth Year (AY 2018-2019)

- Review of SLO4 – Communication Skills using data from methods C,D,F
- Current Student Survey / Focus Groups (Method G)
- Faculty Discussion of Student Outcomes (Method H)

Fifth Year (AY 2019-2020)

- Review of SLO5 – Group Work using data from methods B,C,F
- Faculty Discussion of Student Outcomes (Method H)

VII. Process for Closing the Loop

The Chemistry Department Assessment Committee will be responsible for collecting and summarizing assessment data each semester. Assessment results will be reported at regular department meetings. Near the end of each spring semester, a department meeting will be dedicated to reviewing assessment results, determining what changes, if any, the results suggest, and adjusting the next year's assessment activities as needed. The minutes of this meeting will provide the basis for the department chair's annual report on assessment activities.

VIII. Appendix and Supporting Documents

A – Exam Evaluation Rubric

B – Laboratory Work Evaluation Rubric

C – Written Report Rubric

D – Presentation Rubric (Sample included)

E – Alumni and Employer Questions

F – Gradating Student Questions

G – Current Student Questions

Oral Presentation Rubric (sample)

Scoring:

0-14: Does not meet expectations

15-21: Meets the expectations

22-35: Exceeds expectations

Student Presenter's Name: _____ **Date:** _____ **Time Started:** _____ **Ended:** _____

1. Content

1A. Introduction

Excellent (5 pt.): The opening captivates the audience with interest and/or intrigue. It lays the foundation for the audience to understand the significance and purpose of what follows.

Good (4 pt.): Interesting opening; engages audience.

Average (3 pt.): Opening is minimally engaging.

Poor (1 pt.): Opening is not engaging at all.

Student Score: _____

Written Comments by Evaluator: _____

1B. Statement of Purpose

Excellent (5 pt.): The purpose of presentation is clear. Supporting ideas maintain exceptional focus on the topic.

Good (4 pt.): Topic of the presentation is clear. Content consistently supports the purpose.

Average (3 pt.): Presentation lacks clear direction.

Poor (1 pt.): No clear focus.

Student Score: _____

Written Comments by Evaluator: _____

1C. Organization of Material

Excellent (5 pt.): Information/ideas are presented in a consistently logical sequence. Transition/connections are eloquent. A strong sense of wholeness is conveyed. The "Conclusions" section leaves the audience with a strong sense of closure.

Good (4 pt.): Important ideas and information are identified for the audience. Information/ideas are presented in a logical sequence with few lapses. Transitions and connections are made. Closing effectively summarizes the presentation.

Average (3 pt.): Irrelevant, unnecessary information detracts. Big ideas are not specifically identified. There are significant lapses in the order of ideas. Transitions are inconsistent and weak or missing. Closing demonstrates an attempt to summarize.

Poor (1 pt.): No clear organization. Ideas do not connect with one another. There are no clear transitions. No closing is evident.

Student Score: _____

Written Comments by Evaluator: _____

1D. Literature Review & Citation

Excellent (5 pt.): Literature review is from appropriate scientific journals, covers the topic in depth, and demonstrates the ability to extract the salient features of the articles.

Good (4 pt.): Literature review is from appropriate scientific journals but gives a shallow survey of the literature.

Average (3 pt.): Literature review is from appropriate scientific journals but very few articles are presented.

Poor (1 pt.): No scientific journals have been surveyed, only an internet search of popular magazines and sites.

Student Score: _____

Written Comments by Evaluator: _____

2. Oral Presentation

2A. Speaking Ability

- Excellent (5 pt.):* Commands audience politely using eye contact, making sure audience is ready. Can be heard by all members of audience without assistance. Uses visual aid as guide or outline for speaking. Consistently maintains eye contact. Notes are either not used or used at a minimum. An appropriate pace (not too fast and not too slow) is kept throughout the presentation.
- Good (4 pt.):* Makes sure audience is ready before starting. May need reminders from audience to speak up; generally consistent, maintains eye contact, minimizes reliance on notes.
- Average (3 pt.):* Makes occasional eye contact, makes few attempts to command audience; may start speaking before audience is ready. Needs reminders from audience to speak up. Mostly reads from notes (or PowerPoint slides).
- Poor (1 pt.):* Audience hears with great difficulty. Reads from notes (or PowerPoint slides) and seldom establishes eye contact.

Student Score: _____

Written Comments by Evaluator: _____

2B. Visual Aids

- Excellent (5 pt.):* Visual aids are readable and attractive from all parts of the room. Graphic is clear and professional looking, enhancing the message. Citations are clearly given for the material taken out of scientific literature.
- Good (4 pt.):* Visual aid readable from all parts of the room. Graphic is neat. Appropriate graphics are chosen to depict the message.
- Average (3 pt.):* Visual aid is not completely accessible to all audience members. Graphic may be messy. Visual may not be most appropriate to support presentation.
- Poor (1 pt.):* Visual aid undecipherable. Graphic detracts from message. Messy or inappropriate visuals.

Student Score: _____

Written Comments by Evaluator: _____

2C. Question & Answer Session

- Excellent (5 pt.):* Speaker understands the specific question asked and responds to it concisely. Expands upon previous statements. Cites additional examples to answer a question. Conveys a thorough knowledge of subject.
- Good (4 pt.):* Thoughtful, concise response. Conveys reasonable knowledge of subject.
- Average (3 pt.):* Response not clear or did not add to comprehension of the listener.
- Poor (1 pt.):* Could not answer questions or answers are irrelevant.

Student Score: _____

Written Comments by Evaluating Faculty: _____