

# 2023-2024 Chemistry Annual Assessment Report

## Bachelor Chemistry

### Mission

The Biology and Chemistry Department believes that every student deserves a first-class education. We are educators at Fitchburg State because our personal values align with the campus values of equity and excellence. We strive to ensure that our students have the best of what we can offer them as they gain an in-depth knowledge of science that is part of a larger interdisciplinary, multicultural liberal arts and sciences education.

### Academic Year 2023-2024

### Bachelor Chemistry Learning Outcomes

#### Disciplinary knowledge

Students should understand and be able to apply their understanding of all chemistry sub-disciplines and use appropriate laboratory skills and instrumentation to solve problems. These areas of knowledge include:

- Basic chemical concepts such as stoichiometry, states of matter, atomic structure, molecular structure and bonding, thermodynamics, equilibria, and kinetics.

- Foundational knowledge and skills in analytical chemistry, biochemistry, inorganic chemistry, organic chemistry, and physical chemistry.

- Foundational laboratory skills including synthesis of molecules, measurement of chemical properties, determination of structures, use of modern instrumentation and computational modeling.

MEASURES	RESULTS	ACTIONS
<p><b>Annual Capstone Exam</b></p> <p>Direct - Exam (Course)</p> <p><i>Chemistry Seminar: CHEM 4750</i></p> <p><b>Target</b></p> <p>90% of students to score &gt; 50% 80% of students to score &gt; 70% Aggregate student performance in subject areas monitored.</p>	<p><b>NOT MET</b></p> <p><a href="#">Results from Chemistry disciplinary knowledge exam from Fall 2023 administered in Chemistry Seminar.docx</a></p> <p><b>Analysis</b></p> <p>50% (three of six students) scored greater than 50%, though two additional student scores just missed the goal (both exactly 50.0%). 33% (two of six students) scored greater than 70%.</p> <p>Interpretation of results limited by small sample size (n=6) and high proportion (2/3) of transfer students. Greater reinforcement of introductory material in upper division chemistry classes may be needed. General Chemistry content is currently covered in Organic pre-lab questions, and this should help students review the material, though scores tend to be low. These scores may also reflect challenges faced by the COVID cohort, though results from past years have been similar</p>	<p><b>Revise Measurement / Assessment</b></p> <p><b>Not Started</b></p> <p>Review disciplinary knowledge questions for difficulty and divide into sub-topics to identify areas of weakness</p> <p><b>Updates</b></p> <p><i>May 29, 2024 by John Ludlam</i></p> <p>Also review outcome statement vs what is actually assessed, particularly upper level knowledge and skills.</p>

#### Lab skills

Students should be able to demonstrate and apply foundational laboratory skills. The areas of skills include:

- Basic laboratory skills such as keeping a notebook, use of electronic balances and volumetric glassware, preparation of solutions, chemical measurements using pH electrodes and spectrophotometers.

- Prepare solutions, record data correctly, and perform chemical synthesis and analysis of compounds, as well as use standard laboratory equipment and programs to solve problems.

MEASURES	RESULTS	ACTIONS
<p><b>Embedded exam questions</b></p> <p>Direct - Exam (Course)</p> <p><i>Organic Chemistry I: CHEM 2000</i></p>	<p><i>No results have been added.</i></p>	<p><i>No actions have been added.</i></p>

## Bachelor Chemistry

<b>Target</b>		
90% of students to score > 70%		

## Safety

Students should be able to demonstrate and apply their understanding of the concepts of safe lab practices, and be able to evaluate and assess safety risks associated with laboratory experiences. Students must be able to:

- Carry out responsible disposal techniques
- Comply with safety regulations
- Properly use personal protective equipment to minimize exposure to hazards
- Recognize chemical and physical hazards in laboratories, assess the risks from these hazards, know how to minimize the risks, and prepare for emergencies.
- Understand the categories of hazards associated with chemicals (health, physical, and environmental)
- Use Safety Data Sheets (SDSs) and other standard printed and online safety reference

MEASURES	RESULTS	ACTIONS								
<p><b>Embedded pre-lab questions</b></p> <p><i>Organic Chemistry I: CHEM 2000</i></p> <p><b>Target</b></p> <p>I. 90% of students to score &gt;70% II. 95% of students to score &gt; 90%</p>	<p><b>MET</b></p> <p>Embedded pre-lab questions</p> <p>■ Met ■ Not Met</p> <table> <tr> <td>Met:</td> <td>90%</td> </tr> <tr> <td>Not Met:</td> <td>10%</td> </tr> <tr> <td>Met Total:</td> <td>90%</td> </tr> <tr> <td>Not Met Total:</td> <td>10%</td> </tr> </table> <p><b>Analysis</b></p> <p>Safety was assessed with embedded pre-lab questions in Organic Chemistry CHEM 2000 in Fall 2023. One to three questions addressing safety were asked in each of six different labs for a total of 13 questions. The criteria for success was 90% of students to score &gt;70%. This target was met (90% or 36 of 40 students scored &gt;70%) and the average score was 89%.</p>	Met:	90%	Not Met:	10%	Met Total:	90%	Not Met Total:	10%	<p><b>Gather Additional Data</b></p> <p><b>Not Started</b></p> <p>Continue assessment</p>
Met:	90%									
Not Met:	10%									
Met Total:	90%									
Not Met Total:	10%									
<p><b>Chemical Hygiene Assignment</b></p> <p><i>Organic Chemistry I: CHEM 2000</i></p> <p><b>Target</b></p> <p>I. 90% of students to score &gt;70% II. 95% of students to score &gt; 90%</p>	<p><i>No results have been added.</i></p>	<p><i>No actions have been added.</i></p>								

## Communication skills

Students should be able to present information in a clear and organized manner, write well-organized and concise reports in a scientifically appropriate style, and use relevant technology in their communications.

MEASURES	RESULTS	ACTIONS
<b>Oral Presentations</b>	<b>MET</b>	<b>Other - [Adopt new standard for presentations]</b>

## Bachelor Chemistry

Direct - Presentation

*Chemistry Seminar: CHEM 4750***Target**

A majority of students should demonstrate a proficiency on oral presentations by attaining a score  $\geq 2$  (sufficient)

[Oral Presentation\\_Report\\_V1.docx](#)[Capstone Chemistry Seminar Presentation results Fall 2023.xlsx](#)**Analysis**

Analysis: On six of the seven outcomes assessed, a majority of students demonstrated sufficient or greater. A majority of students scored less than proficient on "Proper citation of others' work". Students in the course did well using sources in the written term paper, so clearly they can cite their sources. Instead, there may have been confusion about the research presentation format. At the spring departmental retreat (5/16/2024) there was discussion of adopting the American Chemical Society format in order to improve proper citation in oral presentations. This format includes a full bibliographic reference on the slide where information is referenced rather than at the end of the presentation.

**IN PROGRESS**

At the spring departmental retreat (5/16/2024) there was discussion of adopting the American Chemical Society format in order to improve proper citation in oral presentations. This format includes a full bibliographic reference on the slide where information is referenced rather than at the end of the presentation.