

Program Learning Outcomes

I= Introduced
R= Reinforced
M= Mastered

Program Name: Chemistry B.S.

Date: 10-4-2021

Program Learning Outcomes Knowledge, skill, or behavior students can demonstrate upon program completion		Courses Mapped to Outcomes											
		Chem 125/126	Chem 127/128	Chem 221	Chem 231	Chem 255	Chem 256A	Chem 256B	Chem 311	Chem 314	Chem 315	Chem 322	Chem 324
1	Students will demonstrate knowledge in all major fields of chemistry including analytical, biochemistry, inorganic, organic, and physical.	I	I	R	M	R	M	M	M	M	M	M	M
2	Students will show understanding in the theory and practice of laboratory techniques and major instrumentation, and use safe procedures in a chemistry laboratory.	I	I	R	M	R	M	M	M	R	M	M	M
3	Students will demonstrate problem-solving skills, chemical information skills (including reading the literature), and computer/computational skills.	I	I	R	R	R	R	M	R	R	M	R	R
4	Students will demonstrate an ability to design and conduct experiments, as well as to analyze and interpret data.	N/A	I	R	R	R	R	M	R	R	M	N/A	M
5	Students will show proficiency in scientific communication including laboratory notebooks, laboratory reports, research proposals, journal articles, oral and poster presentations, and working in groups.	I	I	R	R	R	R	M	R	R	M	R	R
6	Students will demonstrate an understanding of professional and ethical responsibility, of the impact of	I	I	R	R	R	R	R	M	M	R	R	N/A

	chemistry in a global, social context, and of the importance of inclusive excellence in chemistry.												
7	Students will demonstrate an understanding of the connections between chemistry and other science disciplines.	I	N/A	N/A	R	R	R	M	M	M	M	R	R
8	Students will have a successful transition to their post-college activities.	I	I	R	R	R	R	M	M	M	R	R	R/M
		Chem 331	Chem 332	Chem 335	Chem 343	Chem 344	Chem 345	Chem 346	Chem 350 NMR Spectroscopy	Chem 352 Organic Mechanisms	Chem 352 Organometallics	Chem 354 Comp Chem Modeling	Chem 490 (Research)
1	Students will demonstrate knowledge in all major fields of chemistry including analytical, biochemistry, inorganic, organic, and physical.	M	M	R	M	M	M	M	R	M	M	M	I/R/M
2	Students will show understanding in the theory and practice of laboratory techniques and major instrumentation, and use safe procedures in a chemistry laboratory.	M	M	M	N/A	NA	M	M	M	N/A	N/A	N/A	M
3	Students will demonstrate problem-solving skills, chemical information skills (including reading the literature), and computer/computational skills.	R	R	M	M	M	R	R	M	M	M	M	I/R/M
4	Students will demonstrate an ability to design and conduct experiments, as well as to analyze and interpret data.	I	M	M	N/A	NA	M	M	M	N/A	N/A	N/A	M

5	Students will show proficiency in scientific communication including laboratory notebooks, laboratory reports, research proposals, journal articles, oral and poster presentations, and working in groups.	I	M	M	R	R	M	M	R	M	M	M	I/R/M
6	Students will demonstrate an understanding of professional and ethical responsibility, of the impact of chemistry in a global, social context, and of the importance of inclusive excellence in chemistry.	R	R	R	M	R	R	M	R	R	R	R	R
7	Students will demonstrate an understanding of the connections between chemistry and other science disciplines.	R	R	M	M	M	M	M	N/A	R	R	M	R
8	Students will have a successful transition to their post-college activities.	R	R	M	M	M	M	M	R	M	M	M	I/R/M

Program Learning Outcomes: Assessment Tools

Program Name: Chemistry B.S.

Date: 10-4-2021

Program Learning Outcomes Knowledge, skill, or behavior students can demonstrate upon program completion	Measurement Tool	Timeline/Frequency of Assessment	Target	Review
1 Students will demonstrate knowledge in all major fields of chemistry including analytical, biochemistry, inorganic, organic, and physical.	ACS Exams: Chem 125/6 and 131 Gen Chem Chem 231 Organic Chem 314 Biochem Chem 322 Inorganic Chem 331 Analytical Chem 344 Physical Chem	Exams will be given every year, and subdisciplines will report their data (class averages) once every five years (see Review column on right for subdisciplinary reporting schedule).	125/6: average above 50%ile 231: average above 80%ile 314: average above 65%ile 322: average above 60%ile 331: average above 80%ile 343: median above 60%ile 344: median above 70%ile	Cycle through subdisciplines (ABIOP) 2021 Analyt 2022 Biochem 2023 Inorganic 2024 Organic 2025 Physical The chair of the assessment committee requests data from the appropriate subdisciplinary faculty. The data is assembled into a spreadsheet and discussed by the entire department in April. Action items to inform improvement are planned at that meeting.
2 Students will show understanding in the theory and practice of laboratory techniques and major instrumentation, and use safe procedures in a chemistry laboratory.	Chem 255/256: Organic quizzes, final exam, lab practical Chem 332: lab reports and final oral exam Safety Training	Subdisciplines will report results every five years. Safety Training offered to TAs, research students, and faculty every semester and in summer (students and faculty must do once a year)	255/256: All students will pass the final exam with a C- or better 332: All students complete the lab reports and final oral exam with C- or better All TAs and research students successfully complete safety test	Review Chem 255/256 and Chem 332 during their sub disciplinary review year Review Safety Training program every year
3 Students will demonstrate problem-solving skills, chemical information skills, and computer/computational skills.	Chem 125/127/132: Students use Excel spreadsheets for quant analysis Chem 256B: Organic special projects (chem info) Chem 322: Inorganic lit discussions	Subdisciplines will report results every five years.	125/127/132: 90% of students will successfully use Excel spreadsheets in at least 2 lab reports 256B: Students write successful research proposal that demonstrates their chem info skills	Cycle through subdisciplines (ABIOP) 2021 Analyt 2022 Biochem 2023 Inorganic

		(reading the lit) Chem 345/346: PChem - Data analysis for lab reports		322: All students will successfully answer questions linked to literature discussion 345/346: All students will pass lab demonstrating proficiency in basic computer skills	2024 Organic 2025 Physical
4	Students will demonstrate an ability to design and conduct experiments, as well as to analyze and interpret data.	Chem 324: Inorganic proposal for research project and report Chem 315: Biochem lab CUREs - students address written questions about design and propose/choose substrates to test for enzyme activity	Subdisciplines will report results every five years.	324: All students write novel and lit-supported proposal 315: 90% of students produce workable protein purification and assay procedure	Review during sub disciplinary review year
5	Students will show proficiency in scientific communication including laboratory notebooks, laboratory reports, research proposals, journal articles, oral and poster presentations, and working in groups.	Notebooks - Chem 255/256: Students write prelab, experimental documentation, analysis, conclusions Lab reports - Chem 345/346: Students write with effective grammar and create plots/tables to clearly communicate data and results Research proposals - Chem 324: Students write independent research proposal and carry out the research Journal articles - Chem 324: Students write journal-style lab report Working in groups - Survey faculty on assessment of group work	Subdisciplines will report results every five years. Faculty will be surveyed about group work for ACS Periodic Report (every six years).	Notebooks - All students successfully complete laboratory prelab, documentation of experimental details, and conclusions Lab reports - All students pass P Chem lab Research proposals - All students write well-documented and original research proposal Journal articles - Students use ACS-journal guidelines for writing research report Working in groups: One or more faculty provide evidence of the development of group skills	Cycle through subdisciplines (ABIOP) 2021 Analyt 2022 Biochem 2023 Inorganic 2024 Organic 2025 Physical
6	Students will demonstrate an understanding of professional and ethical responsibility, of the impact of chemistry in a global, social context, and of the importance of inclusive excellence in chemistry.	CHEM 221/231: Seminar reports include connecting what students hear in seminar to their own lives, learning in other courses, career aspirations, etc. Chem 332: Students write professional memos for "clients" Summer Research: Responsible	Subdisciplines will report results every five years. Responsible conduct workshop is assessed every summer DEI plans: Every year	221/231: At least half of student seminar reports will include examples of student "connection-making" 322: All students successfully report to clients in at least two of four memos (grade 9/10) and all students successfully complete one	Review course-linked measures during sub disciplinary review year

		conduct of research workshop Department DEI work: Faculty will include examples of diverse scientists and their work in their courses; the department will plan informal opportunities (or "un-office hours") to gather with students in settings that are especially welcoming to underrepresented students		memo (of two possible memos) that includes the critical comparison of two analytical techniques and makes recommendation	
7	Students will demonstrate an understanding of the connections between chemistry and other science disciplines.	Chem 311/314: Biochemistry I and II exams and problem sets are designed so that students connect cell biology and mammalian physiology to biochemical and organic chemistry concepts. Biochemistry I and II exams and problem sets that are disease-based allow students to demonstrate their understanding of biochemistry with human health. Chemistry seminar program: Joint seminars with other disciplines provide real world examples of connections between disciplines	Biochemistry will report results every five years.	311/314: Greater than 95% of students will successfully complete (grade of B- or better) the interdisciplinary exercises	311/314 reviewed during their sub disciplinary year
8	Students will have a successful transition to their post-college activities.	Post-graduation outcomes are tracked by the department with the support of the alumni office.	Ongoing	85% of grads out 2-5 years are either in grad school, professional school, or employed in a chemistry-related job	Review annually