

Hunter College Department of Chemistry

Program Goals, Learning Outcomes, & Assessments

Overview

The chemistry and biochemistry majors provide training for students planning careers in the chemical sciences, biology, medicine, earth sciences, secondary education, business, and law across the chemical enterprise in academia, industry, government, and private practice. Each graduating chemistry and biochemistry major will have completed a rigorous program that includes foundational course work in chemistry and in-depth course work in chemistry or biochemistry in an integrated, flexible program that follows the American Chemical Society guidelines. The ACS-certified degree further emphasizes laboratory experience and the development of professional skills. Advanced coursework and educational activities outside the traditional classroom, such as independent research, provide students the opportunity to participate as a member of a research team. Many undergraduate students also take some of the graduate courses in synthetic, radiochemistry, and physical chemistry.

The intended goal for students graduating as chemistry and biochemistry majors is to acquire a set of core competencies that are: (I) knowledge-based; (II) performance/skills based, student centered; (III) affective.

- I. Students will develop a knowledge and understanding of chemistry and use it to communicate results from scientific studies in the field of chemistry in formats suitable to the profession. Students will evaluate literature and other information relevant to their work, summarize information in tables and graphs, write effective reports, and give effective oral presentations.
- II. Students will perform and evaluate scientific experiments and studies in the field of chemistry. Students will perform experiments using accepted laboratory practices, evaluate results in the context of relevant scientific principles, propose appropriate future directions for the study based upon the findings, and work as part of a team. Students will demonstrate concern for the health and safety of others by using proper safety protocols.
- III. Students will act as socially responsible members of the profession and apply chemical principles to everyday life.

I. Knowledge-Based Outcomes

Our graduates should be able to:

1. Formulate and explain the fundamental concepts in the core areas of the discipline (organic, inorganic, analytical, physical, and/or biological chemistry).
2. Solve problems competently by identifying the essential parts of a problem and formulating a strategy for solving the problem. They should be able to rationally estimate the solution to a problem, apply appropriate techniques to arrive at a solution, test the correctness of the solution, and interpret their results.
3. Analyze and process data using appropriate computer software.
4. Employ modern web-based literature search tools to locate and retrieve scientific information and to critically evaluate the source.

II. Performance/Skills based, Student Centered Outcomes

Our graduates should have the ability to:

5. Design and/or explain the objective of chemical experiments, properly carry out the experiments, and appropriately record and analyze the results.
6. Use standard laboratory equipment, modern instrumentation, and chemical techniques to carry out experiments.
7. Identify and follow the proper procedures and regulations for safe handling and use of chemicals while applying the highest standards of ethics.
8. Utilize effective written and oral communication skills to report and explain research findings to chemists, other scientists, and the lay public.

III. Affective Outcomes

9. Our graduates should have sufficient breadth and depth of knowledge to be able to successfully plan and pursue a variety of careers in the chemical sciences. They should also have acquired the ability to expand their knowledge in any area of chemistry as necessary to adjust to changes in science and technologies and become contributing members of the scientific community.

Table II. Relationship between learning outcomes and assessment and evaluation methods.

LEARNING OUTCOME	ASSESSMENT & EVALUATION
1-4	Final exams in the core first year (general chemistry I and II) and second year (organic I and II) courses will be reviewed for appropriate content knowledge by comparing them to the standards provided by the American Chemical Society (ACS). The ACS exams will be periodically given as a comparative evaluation of our summative assessments in these classes.
1-4	Final exams in third year courses (physical chemistry I & II, biophysical chemistry, biochemistry I & II, and quantitative analysis) courses will be reviewed for appropriate content knowledge by comparing them to the standards provided by the ACS. The ACS exams will be periodically given as a comparative evaluation of our summative assessments in these classes.

1-4 Students will successfully complete the associated laboratories of the above classes. The written lab reports will be graded using rubrics set by the course coordinators and approved by the department's curriculum committee. Samples of student work will be collected and evaluated.

4 Students' lab projects in third year courses will include retrieving information using modern literature search tools (e.g. SciFinder to find about chemical safety, chemical techniques, etc.). Students will be advised to include relevant findings in lab reports. Samples of student work will be collected and evaluated.

5-8 A portfolio of laboratory reports will be periodically reviewed and evaluated for technical writing skills using ACS guidelines.

8 Reports, presentations, and papers prepared for advanced courses (e.g., introduction to nanotechnology, biological spectroscopy, inorganic chemistry, bioinformatics, and medicinal chemistry) will be periodically reviewed and evaluated for effective written and oral communication.

9 Periodically, alumni will be informally surveyed and asked whether they were adequately prepared for their chosen career and whether they were provided with an adequate understanding of their career options.

Formative and Summative Assessments

- A homework and other assignments, quizzes (including clicker)
- B exams
- C lab reports
- D reports and projects
- E oral presentations, posters, abstracts
- F group projects
- G standardized tests

Hunter College Department of Chemistry Curriculum MAP

Learning Outcome I Students will develop knowledge and understanding of chemistry concepts		Learning Outcome II Students will develop scientific literacy			Learning Outcome III Students will develop skills to be socially responsible members of the society and their profession			
<ul style="list-style-type: none"> Data Analysis Problem Solving Instrumentation and Lab Techniques 		<ul style="list-style-type: none"> Literature search and critical reading Effective communication Problem solving Data analysis Design experiments 			<ul style="list-style-type: none"> Safety and ethics Preparation for Careers Effective Communication 			
Student Centered Learning Outcomes (I-III) and Assessment Methods (A-G)								
Course #	LO I. chemical knowledge	LO I & II problem solving	LO I & II data analysis	LO II literature	LO I & II design experiments	LO I methods instrumentation	LO III safety / ethics	LO II effective communication
100 non-majors	ABFG	ABF	ABF	A				
101 pathways	ABCDEF	ABCDF	ACDEF	CDEF	CDEF	CDEF	ACDF	DEF
102 general 1	ABDFG	ABFG	ABFG					DF
103 general 1 lab	CDEF	CDF	CDEF	CDF	CDF	CDF	ACDF	CDEF
104 general 2	ABDFG	ABFG	ABFG					DF
105 general 2 lab	CDEF	CDF	CDEF	CDF	CDF	CDF	ACDF	CDEF
106 combin. lab	CDEF	CDF	CDEF	CDF	CDF	CDF	ACDF	CDEF
111 hon. Gen. 1	ABDFG	ABFG	ABFG					DF
112 hon. Gen 2	ABDFG	ABFG	ABFG					DF
115 gen. segway	ABDFG	ABFG	ABFG					DF
120 nurse org.	ABD	AB	A					BD
121 nurse org. lab	CDF	C	C		C	C	AC	CDF
150 peer teach.	DF	DF	DF	DF			DF	DF
222 orgo. 1	AB	AB	AB	AB				AB
223 orgo. 1 lab	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC
224 orgo. 2	AB	AB	AB	AB				AB
225 orgo. 2 lab	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC
249 quant.	ABCDEF	ABCD	ABC	CDEF	CDF	CF	CDEF	EF
295 teach lab	DF	DF	DF	DF	DF	DF	DF	DF
322 adv. orgo.	ABEF	ABEF	ABEF	ABEF				ABEF
349 inst. anal.	ABCDEF	ABCD	AC	CDE	CDF	CF	CDEF	EF
350 biophys.	ABF	ABF		AB	AB			AB
352 p-chem 1	AB	AB	AB		AB	AB	AB	
354 p-chem 2	AB	AB	AB		AB	AB	AB	
355 p-chem 1 lab	CDF	CDF	CDF	CDF	CDF	CDF	CDF	CDF
356 p-chem 2 lab	CDF	CDF	CDF	CDF	CDF	CDF	CDF	CDF
366 inorganic	ABD	ABD	ABD	D		ABE	ABD	ABD
376 biochem. 1	AB	AB	AB	AB	AB	AB	AB	AB
377 biochem. 2	ABG	ABG		ABG		ABG	ABG	ABG
378 biochem. lab	ABCD	ABCD	ABCD	ABCD	ABCD	ABCD	ABCD	ABCD
388.57 medic.	ABEF	ABEF	ABEF	ABEF				ABEF
388.51 nano.	ABDE	ABDE	ABDE	ABD	ABDE	A	ABD	DE
333.01 bioinform.	ADEF	ADEF	ADEF	ADEF				ADEF
388.54 struct. func.	ABEF	ABEF		ABEF				EF
388.56 biospec.	ABEF	ABEF	ABEF	ABEF				
291 research	ACDEF	ACDEF	ACDEF	ACDEF	ACDEF	ACDEF	ACDEF	ACDEF

491 honors res.	CDEF	CDEF	CDEF	CDEF	CDEF	CDEF	CDEF	CDEF

Chemistry Department Program Learning Outcomes Mapped to the Institutional Learning Outcomes

Institutional Learning Outcome	Program Learning Outcome	Courses	Assessment tool
#1 Think critically	<p>I.2 Solve problems competently by identifying the essential parts of a problem and formulating a strategy for solving the problem. They should be able to rationally estimate the solution to a problem, apply appropriate techniques to arrive at a solution, test the correctness of the solution, and interpret their results</p> <p>I.3 Analyze and process data using appropriate computer software.</p>	CHEM: 101, 103, 105, 106, 121, 223, 225, 249, 349, 355, 356, 366, 378, 388.51, 333.01, 291, 491	C, D, E
#2 Think creatively	#II.5 Design and/or explain the objective of chemical experiments, properly carry out the experiments, and appropriately record and analyze the results.	CHEM: 101, 103, 105, 106, 121, 223, 225, 249, 349, 355, 356, 378, 388.51, 291, 491	C, D, E
#3 Research effectively	#I.4 Employ modern web-based literature search tools to locate and retrieve scientific information and to critically evaluate the source.	CHEM: 101, 103, 105, 106, 249, 349, 355, 356, 366, 378, 388.51, 333.01, 291, 491	C, D, E
#4 Communicate effectively	#II.8 Utilize effective written and oral communication skills to report and explain research findings to chemists, other scientists, and the lay public.	CHEM: 101, 103, 105, 106, 121, 225, 249, 349, 355, 356, 366, 378, 388.51, 333.01, 291, 491	C, D, E
#5 Value global awareness			