

Department of

Chemistry



Les Manner, Department Chair

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Introduction

Chemistry is the study of matter, energy, and their transformations. The principles of this discipline serve as a theoretical basis for a wide variety of fields such as agriculture, biology, dentistry, engineering, geology, medicine, nutrition, and physics. In addition, chemistry's analytical and logical approach to the world is excellent training for fields such as law and government.

The Department of Chemistry offers three degrees:

- A Bachelor's of Science in Chemistry.
- A Bachelor's of Science in Biochemistry.
- A Bachelor's of Science in Chemistry Education.

In addition to the courses offered for chemistry majors, the department offers service courses to support students in technical majors to meet their requirements for graduation. Introductory courses are offered on several skill levels to meet the needs of incoming students with a variety of backgrounds in math and science.

Studying chemistry at Brigham Young University-Idaho is a unique and rewarding experience. The faculty is experienced and well trained. Their commitment to students and teaching, coupled with small class sizes, provide an excellent learning environment.

Further information regarding the department programs and degrees can be obtained by visiting the department web page:

<http://www.byui.edu/chemistry/>

Chemistry

Brigham Young University-Idaho 2014-2015

BS in Biochemistry (705)

Take required Foundation courses

Major Requirements

No Grade Less Than C- in Major Courses

Introductory Chemistry Core <i>Take these courses:</i> CHEM 105 4 CHEM 106 4 CHEM 351 4 <hr style="width: 50px; margin-left: 0;"/> 12	<i>Take these courses:</i> CHEM 220 5 CHEM 352 4 CHEM 391 2 CHEM 468 3 CHEM 481 3 CHEM 482 3 CHEM 485 1 CHEM 498 1-3 BIO 180 4 BIO 321 4 MATH 113 3 PH 121 3 PH 150 1 PH 220 3 PH 250 1 <hr style="width: 50px; margin-left: 0;"/> 41	Biology Cluster <i>Take these courses:</i> BIO 181 4 BIO 375 3 BIO 376 3 BIO 377 3 <hr style="width: 50px; margin-left: 0;"/> 13	Program Notes: For a recommended sequence of courses, please refer to the advising information on the department website: www.byui.edu/chemistry/advising Double Counting allowed in major and minor courses. Double Counting NOT allowed in major and cluster courses. Biochemistry majors may need to request a track adjustment for the Fall/Winter track upon beginning their junior-level chemistry courses. Please consult with faculty advisor.
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Total Major Credits=66

Additional Elective Credits Required for Graduation - 14

This major is available on the following tracks:

Fall-Winter---- YES

Winter-Spring---- YES

Spring-Fall---- YES

BS in Chemistry (710)

Take required Foundation courses

Major Requirements

No Grade Less Than C- in Major Courses

Introductory Chemistry Core <i>Take these courses:</i> CHEM 105 4 CHEM 106 4 CHEM 351 4 <hr style="width: 50px; margin-left: 0;"/> 12	<i>Take these courses:</i> CHEM 220 5 CHEM 352 4 CHEM 391 2 CHEM 420 2 CHEM 421 2 CHEM 461 3 CHEM 462 3 CHEM 464 2 CHEM 470 3 CHEM 471 2 CHEM 481 3 CHEM 498 1-3 PH 220 3 PH 250 1 <hr style="width: 50px; margin-left: 0;"/> 36	Take this Physics and Math Cluster: MATH 215 4 MATH 316 4 PH 121 3 PH 150 1 <hr style="width: 50px; margin-left: 0;"/> 12	Program Notes: For a recommended sequence of courses, please refer to the advising information on the department website: www.byui.edu/chemistry/advising Double Counting allowed in major and minor courses. Double Counting NOT allowed in major and cluster courses. Chemistry majors may need to request a track adjustment for the Fall/Winter track upon beginning their junior level chemistry courses. Please consult with faculty advisor.
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Total Major Credits=60

Additional Elective Credits Required for Graduation - 20

This major is available on the following tracks:

Fall-Winter---- YES

Winter-Spring---- YES

Spring-Fall---- YES

BS in Chemistry Education (810)

Take required Foundation courses

Major Requirements

No Grade Less Than C- in Major Courses

Education: <i>Take these courses:</i> ED 200 2 ED 304 3 ED 461 3 ED 492 10 SPED 360 <u> 2</u> 20	Introductory Core <i>Take these courses during your first 2 semesters:</i> CHEM 105 4 CHEM 106 4 PH 121 3 PH 150 <u> 1</u> 12 Chemistry <i>Take these courses:</i> BIO 305 2 CHEM 220 5 CHEM 351 4 CHEM 405 <u> 2</u> 13 <i>Take 1 course:</i> CHEM 461 3 CHEM 468 <u> 3</u> 3	Chemistry Electives <i>Take 7 credits:</i> CHEM 352 4 CHEM 420 2 CHEM 421 2 CHEM 462 3 CHEM 464 2 CHEM 470 3 CHEM 471 2 CHEM 481 <u> 3</u> 7 Mathematics <i>Take 1 course:</i> MATH 113 3 MATH 215 <u> 4</u> 3	Physics <i>Take this course:</i> PH 220 <u> 3</u> 3 Physics Electives <i>Take 1 course:</i> PH 123 3 PH 250 1 PH 311 <u> 3</u> 1	Program Notes: It is recommended that students minor in either Math Ed, Physics Ed, or Physical Science Ed to stay within the 120 credit limit. Double Counting allowed in major and minor courses.
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Total Major Credits=42

Education Core Credits=20

This major is available on the following tracks:

Fall-Winter---- YES

Winter-Spring---- YES

Spring-Fall---- YES

Minor in Chemistry (146)

Minor Requirements

No Grade Less Than C- in Minor Courses

Chemistry Courses <i>Take these courses:</i> CHEM 105 4 CHEM 106 <u> 4</u> 8	Chemistry Electives <i>Take 12 credits:</i> CHEM 220 5 CHEM 351 4 CHEM 352 4 CHEM 461 or 468 3 CHEM 462 3 CHEM 464 2 CHEM 470 3 CHEM 471 2 CHEM 481 3 CHEM 482 <u> 3</u> 12	Program Notes: (This section is currently blank in the original document)
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Total Minor Credits=20

This minor is available on the following tracks:

Fall-Winter---- YES

Winter-Spring---- YES

Spring-Fall---- YES

Chemistry

Brigham Young University-Idaho 2014-2015

Minor in Chemistry Education (172)

Minor Requirements

No Grade Less Than C- in Minor Courses

Chemistry Courses <i>Take these courses:</i> CHEM 105 4 CHEM 106 4 <hr style="width: 50px; margin-left: 0;"/> 8	Chemistry Electives <i>Take 12 credits:</i> CHEM 220 5 CHEM 351 4 CHEM 352 4 CHEM 405 2 CHEM 461 or 468 3 CHEM 462 3 CHEM 464 2 CHEM 470 3 CHEM 471 2 CHEM 481 3 CHEM 482 3 <hr style="width: 50px; margin-left: 0;"/> 12	<i>Program Notes:</i>
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Total Minor Credits=20

This minor is available on the following tracks:

Fall-Winter---- YES

Winter-Spring---- YES

Spring-Fall---- YES

Biochemistry Concentration (D 112)

Concentration Requirements

No Grade Less Than C- in Concentration Courses

Introductory Module <i>Take these courses:</i> CHEM 105 4 CHEM 106 4 CHEM 351 4 <hr style="width: 50px; margin-left: 0;"/> 12 <i>Take these courses:</i> BIO 180 4 BIO 377 3 CHEM 220 5 CHEM 481 3 <hr style="width: 50px; margin-left: 0;"/> 15	Chemistry Electives <i>Take 1 course:</i> BIO 321 4 CHEM 352 4 CHEM 482 3 <hr style="width: 50px; margin-left: 0;"/> 3	Interdisciplinary Courses <i>Take these courses:</i> IDS 398R 1-3 IDS 499 2 <hr style="width: 50px; margin-left: 0;"/> 3	<i>Program Notes:</i>
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Total Concentration Credits=33

This concentration is available on the following tracks:

Fall-Winter---- YES

Winter-Spring---- YES

Spring-Fall---- YES

Chemistry Pre-approved Cluster

Chemistry		6500
<i>Take 12 credits:</i>		
CHEM 105	General Chemistry	4
CHEM 106	General Chemistry	4
CHEM 150*	Introductory Organic and Biochemistry	5
CHEM 220	Quantitative Analysis	5
	Total Credits	12
OR		
<i>Take 12 credits:</i>		
CHEM 105	General Chemistry	4
CHEM 106	General Chemistry	4
CHEM 220	Quantitative Analysis	5
CHEM 351*	Organic Chemistry	4
CHEM 352*	Organic Chemistry	4
	Total Credits	12

*Chem 150 cannot count with Chem 351 and/or Chem 352

Animal Health Chemistry		6502
<i>Take at least 12 credits:</i>		
CHEM 105	General Chemistry	4
CHEM 106	General Chemistry	4
CHEM 351	Organic Chemistry	4
CHEM 481	Biochemistry 1	3
CHEM 482	Biochemistry 2	3
	Total Credits	12

Physical Science and Mathematics		6800
<i>Take 12 credits from at least 2 of the following areas:</i>		
Chemistry		
Take any Chemistry class numbered 105 or higher		0-10
(Chem 150 and Chem 153 cannot be taken with Chem 351 and/or Chem 352)		
Physics		
Take any Physics class numbered 105 or higher		0-10
Geology		
Take any Geology class numbered 111 and 111L or higher		0-10
Mathematics		
Take any Mathematics class numbered 111 or higher		0-10
	Total Credits	12

Course Descriptions

Credits*

CHEM 101 Introductory General Chemistry (3:3:0)
Co-requisites: FDMAT 108, FDMAT 108T, FDMAT 110, FDMAT 112, MATH 113, MATH 119, or MATH 109,

An introductory course covering basic concepts in general chemistry. The course is designed for students in home economics, nursing, agriculture, biology, and other areas that require a broad introduction to general and inorganic chemistry. It serves as a preparation for CHEM 150.
(Winter, Spring, Fall)

CHEM 101L Introductory General Chemistry Lab (1:0:3)
Co-requisite: CHEM 101

Chemistry 101L is an online introduction to chemistry lab that illustrates principles of chemistry and laboratory techniques. Participation in the course requires reading pre-lab materials, completion of a pre-lab quiz, watching videos demonstrating laboratory procedures, recording data and observations in electronic format, and completing a post-lab quiz.
(Winter, Spring, Fall)

CHEM 105 General Chemistry I (4:3:4)
Co-requisites: MATH 109, FDMAT 110, FDMAT 112, MATH 113, or MATH 119,

The first semester of a two-semester course designed to meet the general chemistry requirements in engineering, science, and pre-professional majors. This course includes a lecture and laboratory experience.
(Winter, Spring, Fall)

CHEM 106 General Chemistry II (4:3:4)
Prerequisites: CHEM 105; One of the following: FDMAT 110, FDMAT 112, MATH 113, MATH 119, or MATH 109

The second semester of a two-semester course designed to meet the general chemistry requirements in engineering, science, and pre-professional majors. This course includes a lecture and laboratory experience.
(Winter, Spring, Fall)

CHEM 150 Introduction Organic and Biochemistry (5:5:0)
Prerequisites: CHEM 101 or CHEM 105

A one-semester introduction to organic and biochemistry that is a continuation of Chemistry 101 and is designed for students pursuing degrees or advanced training in nursing, dental hygiene, exercise and sports science, or health science. Students who also need an organic and biochemistry laboratory should concurrently register for Chemistry 153. This course is not preparatory for advanced organic and biochemistry courses.
(Winter, Spring)

CHEM 153 Introduction Organic and Biochemistry Lab (1:0:2)
Concurrent requisites: CHEM 150

Laboratory experience that provides an introduction to basic techniques in organic chemistry and introduces the physical and chemical properties of some organic molecules.
(Winter -even years, Spring- odd years)

CHEM 220 Quantitative Analysis (5:3:6)
Prerequisite: CHEM 106

A one-semester course that introduces quantitative analytical techniques, instrumental analysis, and associated chemical principles. This course includes a lecture and laboratory experience.
(Spring, Fall)

CHEM 351 Organic Chemistry I (4:3:4)
Prerequisite: CHEM 106

The first semester of a year-long course that studies the principles and theories of organic chemistry including the properties, preparation, and reactions of organic compounds. The course is designed for students in Chemistry, Chemical Engineering, Pre-medicine, Pre-dentistry, Pre-pharmacy, Pre-veterinary, and Biology. This course includes a lecture and laboratory experience.
(Winter, Spring, Fall)

CHEM 352 Organic Chemistry II (4:3:4)
Prerequisite: CHEM 351

The second semester of a year-long course presenting the principles and theories of organic chemistry including the properties, preparation and reactions of organic compounds. The course is designed for students in Chemistry, Chemical Engineering, Pre-medicine, Pre-dentistry, Pre-veterinary and Biology. This course includes a lecture and laboratory experience.
(Winter, Spring, Fall)

CHEM 391 Technical Writing in Chemical Literature (2:2:0)
Prerequisites: FDENG 201 and CHEM 106

This course provides instruction and experience in advanced writing techniques for students planning careers in chemistry or related scientific disciplines. The course will help students:

- 1) Prepare for further chemistry courses that require scientific writing as a part of their curriculum.
- 2) Search the chemical literature using relevant database tools.
- 3) Develop practical experience in writing for a professional, technical audience.
- 4) Become more effective written communicators in their future scientific careers.

This course is a prerequisite for: CHEM 220, CHEM 464, and CHEM 471.
(Winter, Fall)

<p>CHEM 405 Chemistry Teaching Methods (2:1:2) Prerequisites: ED 361; and CHEM 352 or CHEM 461 This course will focus heavily on preparing students to be competent in laboratory procedures, including lab safety issues. Students will learn how to set up labs, order supplies, and prepare and design laboratory experiments in the sciences. In addition, students will become familiar with how demonstrations can be effectively used in the classroom. Ample opportunity will be given to each student to practice the skills needed to effectively teach chemistry in the secondary schools. Students will become familiar with and learn to apply the national and state science and chemistry standards for teaching chemistry at the secondary level. (Fall)</p>	<p>CHEM 471 Advanced Laboratory (2:0:6) Co-requisite: CHEM 470 This laboratory course includes exercises in the preparation and purification of inorganic compounds utilizing modern synthetic techniques and equipment. Characterization of inorganic compounds will be performed by modern spectroscopic techniques such as nuclear magnetic resonance, UV-vis, infrared, and magnetic susceptibility. (Winter)</p>
<p>CHEM 420 Instrumental Analysis (2:2:0) Prerequisites: CHEM 220, CHEM 352, and PH 250 Concurrent requisite: CHEM 421 A second semester analytical chemistry course building upon, and reinforcing, principles and concepts introduced in CHEM 220 Quantitative Analysis (e.g., the analytical process, data collection, and data analysis). Emphasis will be placed on the theories and applications of modern chemical instrumentation. The correct use and selection of chemical instrumentation for the purpose of solving chemical problems will be investigated. (Fall)</p>	<p>CHEM 481 Biochemistry I (3:3:0) Prerequisite: CHEM 351 The first course in a two-semester series in which students explore the structure and function of proteins, carbohydrates, lipids, and nucleic acids. The course is intended for students majoring in chemistry, biochemistry, or biology and those preparing for advanced studies in graduate or professional schools. (Winter, Spring, Fall)</p>
<p>CHEM 421 Instrumental Analysis Lab (2:0:6) Prerequisites: CHEM 220, CHEM 352, and PH 250 Concurrent requisite: CHEM 420 This course will serve as the accompanying lab to Instrumental Analysis (CHEM 420). Students will gain hands-on experience using a selection of instruments to solve chemical problems. Laboratory experiments will include the use of the following: flame atomic absorption spectrometer, ultraviolet/visible light spectrophotometer, spectrofluorometer, Fourier transform infrared spectrometer, nuclear magnetic resonance spectrometer, gas chromatograph mass spectrometer, liquid chromatograph, capillary electrophoresis instrument, and a potentiostat. (Fall)</p>	<p>CHEM 482 Biochemistry II (3:3:0) Prerequisite: CHEM 481 The second course in a two-semester series in which students explore the metabolic pathways of carbohydrates, lipids, amino acids, and nucleotides. The course is intended for students majoring in chemistry, biochemistry, or biology and those preparing for advanced studies in graduate or professional schools. (Winter, Spring, Fall)</p>
<p>CHEM 461 Physical Chemistry (3:3:0) Prerequisites: CHEM 351 and PH 220; or CHEM 351, PH 220, and MATH 215 First semester of a course covering the fundamental concepts of physical chemistry. This course provides a theoretical and mathematical description of the physical behavior of chemical systems. The first semester covers quantum mechanics and spectroscopy. (Fall)</p>	<p>CHEM 485 Introduction to Biochemistry Lit (1:1:0) Prerequisite: CHEM 481 An introduction to literature databases and scholarly articles published in peer-reviewed journals. Students will develop a portfolio and give an oral presentation of their work. (Winter)</p>
<p>CHEM 462 Physical Chemistry II (3:3:0) Prerequisites: CHEM 461 and MATH 316 Second semester of a course covering the fundamental concepts of physical chemistry. This course provides a theoretical and mathematical description of the physical behavior of chemical systems. The second semester covers statistical mechanics, thermodynamics, and kinetics. (Winter)</p>	<p>CHEM 490 Special Topics in Chemistry (1-3:0:0) Repeatable Course: may earn maximum of 9 credits Prerequisite: CHEM 351 A one-semester course emphasizing current topics in chemistry. Each class participant will select a faculty supervisor who will oversee the design and implementation of a curriculum within a specific field of chemistry. (Winter, Spring, Fall)</p>
<p>CHEM 464 Physical/Instrumental Chemistry Lab (2:0:6) Prerequisites: CHEM 220, CHEM 461, and PH 250 Co-requisite: CHEM 462 Laboratory experience with modern instrumentation in performing physical and analytical chemistry experiments, and practice scientific writing. (Winter)</p>	<p>CHEM 492R Student Research (1-2:0:0) Repeatable Course: may earn maximum of 6 credits A laboratory and/or field experience in which the student performs meaningful research under the mentorship of a faculty member. (Winter, Spring, Fall)</p>
<p>CHEM 468 Physical Biochemistry (3:3:0) Prerequisites: CHEM 481 and PH 220 This course will provide an introduction to physical biochemistry: the application of physical laws of the chemistry to biological systems. (Winter)</p>	<p>CHEM 498 Chemistry Internship (1-3:0:0) All chemistry majors must find and experience a work internship. This would generally occur the semester after their junior year or during their senior year. The experience could involve working for a government agency, industry, an academic institution, or any organization that employs laboratory chemists on their staff. The credit for the internship would count as the capstone experience required for graduation. The student will have a contract agreement with the employer and be responsible to a faculty supervisor. Upon completion of the internship, a written report and a technical presentation will be made to the BYU-Idaho chemistry department as part of the requirement. (Winter, Spring, Fall)</p>
<p>CHEM 470 Inorganic Chemistry (3:3:0) Prerequisite: CHEM 461 This course involves a study of structure, physical and chemical behavior, and bond theory as applied to inorganic chemistry. Using concepts, models, and experimental data, a variety of inorganic systems will be analyzed in a systematic and detailed fashion. Underlying trends in both the elements and also their compounds will be explored and identified. (Winter)</p>	