

Welcome to the

Chemistry Major (BS)

in the College of Computational, Mathematical, and Physical Sciences

College Advisement Center

Website: <https://science.byu.edu/advisement>
Email: science.math.advisement@byu.edu
Phone: 801-422-2674
Office: N-181 ESC

Chemistry and Biochemistry Department

Website: chem.byu.edu
Phone: 801-422-3667
Office: C-100 BNSN

Department Advisement – Sue Mortensen*

Email: suemort@byu.edu
Phone: 801-422-6261
Office: C-104 BNSN

Internship Coordinator – Richard Watt

Email: rwatt@chem.byu.edu
Phone: 801-422-1923
Office: C-210 BNSN

University Career Services – Anna Kennington

Website: careers.byu.edu (Handshake--see flyer in packet)
Email: anna.kennington@byu.edu
Phone: 801-422-5944
Office: C-106 BNSN

Clubs

YChem: Walter Paxton, E111 BNSN, paxton@chem.byu.edu; 801-422-4917

Women in Chemistry: Pam Van Ry, C209 BNSN, pam_vanry@byu.edu, 801-422-1540

Cougs v Cancer: Cristy Welsh, MCDB 261, cancer_research@byu.edu, 801-422-3913

*Please visit Sue Mortensen in the Chemistry and Biochemistry Department (C104 BNSN) as soon as possible if you have not already done so.

Learning outcomes can be found here: <https://learningoutcomes.byu.edu/Courses/program-courses/692821/Chemistry+BS+/1322>



Things to Know

Resources for Graduation Planning

- Flow Charts and Major Academic Plans (MAPs) can be found here: <https://science.byu.edu/advisement/explore-majors-and-minors>.
- Academic advisors in N-181 ESC will help you understand course sequencing and help you plan classes to efficiently fill requirements. They can also help you with study skills and initial career exploration as well as connecting you with correct resources.
- Plan and register from your plan on MyMAP. Your academic advisor can help you understand how to best utilize this resource.
- Evaluate your current program. Periodically major programs are updated. An academic advisor would be happy to review the differences between the programs with you to help you determine what would be best for you.
- Consider meeting with a faculty advisor in your department. Contact info is found on the first page of this packet.

Tutoring Resources and Research

- Volunteer peer tutors are available through Y Serve if you need help with a class. Also, if you excel in a subject, consider serving your fellow students by becoming a tutor. Find out more here: <https://tutoring.byu.edu/>.
- Many departments provide TA Tutorial Labs and research opportunities. Check your department for details:
 - Chemistry and Biochemistry: C-104 BNSN, 801-422-6261, <https://chem.byu.edu/department/faculty/>
 - Computer Science: 3361 TMCB, 801-422-3027, csoffice@cs.byu.edu
 - Geological Sciences: S-389 ESC, 801-422-3918, geology@byu.edu
 - Mathematics: 275 TMCB, 801-422-2061, office@mathematics.byu.edu
 - Mathematics Education: 167 TMCB, 801-422-1735, office@mathed.byu.edu
 - Physics and Astronomy: N-283 ESC, 801-422-4361, physics_office@byu.edu
 - Statistics: 2152 WVB, 801-422-4505, statsec@stat.byu.edu

Prepare Early for a Career

- Check out Careers & Experiential Learning in 1134 WSC and at <https://ucs.byu.edu/>.
- Consider doing an internship.
 - Attend the STEM and Career Fairs held in fall and winter semesters.
 - Talk to your department about internship opportunities.
 - Use LinkedIn and Handshake (see flyer in this packet) to connect with alumni and apply for jobs/internships. BYU Connect is another great resource for networking (connect.byu.edu).
 - Talk with the college Career Director who can help you search for internships as well as assist you with many other career related strategies (see first page of this packet).
- Consider taking StDev 317 (Career Strategies) your junior year.
- Consider taking either Chem 502, CS 502, Geol 502, Math 502, PHSCS 502, or STAT 502 (1-credit Networking Class). Class is held for 1 hour each week.

BS in Chemistry (692821) MAP Sheet

Physical and Mathematical Sciences, Chemistry and Biochemistry

For students entering the degree program during the 2024-2025 curricular year

University Core and Graduation Requirements				Suggested Sequence of Courses			
University Core Requirements:				FRESHMAN YEAR		JUNIOR YEAR	
Requirements	# Classes	Hours	Classes	<u>1st Semester</u>		<u>5th Semester</u>	
Religion Cornerstones				CHEM 111	4.00	CHEM 462	1.00
Teachings and Doctrines of the Book of Mormon	1	2.00	REL A 275	MATH 112	4.00	CHEM 460	3.00
Jesus Christ and the Everlasting Gospel	1	2.00	REL A 250	UNIV 101	2.00	CHEM 497R (opt U/G Research)	1.00
Foundations of the Restoration	1	2.00	REL C 225	Religion Cornerstone Class	2.00	CHEM 514	3.00
The Eternal Family	1	2.00	REL C 200	First Year Writing	3.00	CHEM 518	2.00
BYU Foundations for Student Success				Total Hours:	15.00	GE Religion	2.00
Foundations for Student Success	1	2.00	UNIV 101			GE Arts, Letters, Sciences	3.00
The Individual and Society				<u>2nd Semester</u>		Total Hours:	15.00
American Heritage	1 to 2	3.00-6.00	from approved list	CHEM 112	3.00	<u>6th Semester</u>	
Global and Cultural Awareness	1	3.00	from approved list	CHEM 113	2.00	CHEM 391	3.00
Skills				CHEM 201	0.50	CHEM 463	3.00
First Year Writing	1	3.00	from approved list	MATH 113	4.00	CHEM 464/465	2.00
Advanced Written and Oral Communications	1	3.00	CHEM 391*	Religion Cornerstone Class	2.00	CHEM 497R (Opt U/G Resesarch)	1.00
Quantitative Reasoning	1	4.00	MATH 112*	American Heritage	3.00	GE Arts, Letters, Sciences	3.00
Languages of Learning (Math of Language)	1	4.00	MATH 112*	Total Hours:	14.50	Global and Cultural Awareness	3.00
Arts, Letters and Sciences (Complete 6 of 7)				SOPHMORE YEAR		Total Hours:	15.00
Civilization 1	1	3.00	from approved list	<u>3rd Semester</u>		SENIOR YEAR	
Civilization 2	1	3.00	from approved list	CHEM 227	4.00	<u>7th Semester</u>	
Arts	1	3.00	from approved list	CHEM 351M	3.00	CHEM (Req 3; Opt 3.1 or 3.2)	4.00
Letters	1	3.00	from approved list	MATH 213+MATH 215	3.00	CHEM 594R	0.50
Biological Science	1	3.00-4.00	from approved list	PHSCS 121	3.00	CHEM 497R (Opt U/G Research)	1.00
Physical Science	2	7.00	CHEM 111* and PHSCS 121*	Religion Cornerstone Class	2.00	Requirement 4 Option	3.00
Social Science	1	3.00	from approved list	Total Hours:	15.00	Requirement 4 Option	3.00
Core Enrichment: Electives				<u>4th Semester</u>		GE Religion	2.00
Religion Electives	3 to 4	6.00	from approved list	CHEM 352M	3.00	Open Electives	1.00
Open Electives	Variable	Variable	personal choice	CHEM 354	2.00	Total Hours:	14.50
Graduation Requirements:				CHEM 381M	3.00	<u>8th Semester</u>	
Minimum residence hours required		30.00		GE Arts, Letters, Sciences	3.00	CHEM 495	1.00
Minimum hours needed to graduate		120.00		PHSCS 220	3.00	GE Arts, Letters, Sciences	3.00
				GE Religion Cornerstone Class	2.00	Requirement 4 Option	3.00
				Total Hours:	16.00	Requirement 4 Option	3.00
						GE Religion	2.00
						Total Hours	15.00
*These classes fill both university core and program requirements							

Program Requirements

Requirement 1 — Complete 19 Courses

Note: With department approval, Chem 105 may substitute for Chem 111; and Chem 106 for Chem 112; and Chem 107 for Chem 113. Math 314 may substitute for Chem 460. Note: 2 credit hours of Chem 354 are required.

CHEM 111 - Principles of Chemistry 1 4.0
CHEM 112 - Principles of Chemistry 2 3.0
CHEM 113 - Intro General Chemistry Lab 2.0
CHEM 201 - Chem Handling & Safe Lab Prac 0.5
CHEM 227 - Principles of Chem Analysis 4.0
CHEM 351M - Organic Chemistry 1 - Majors 3.0
CHEM 352M - Organic Chemistry 2 - Majors 3.0
CHEM 354 - Organic Chem Lab-Major 2.0
CHEM 381M - Biochem Fundamentals 3.0
CHEM 391 - Tech Writing Using Chem Lit 3.0
CHEM 460 - Math for Physical Chemistry 1.0
CHEM 462 - Physical Chemistry 1 3.0
CHEM 463 - Physical Chemistry 2 3.0
CHEM 464 - Physical Chemistry Lab 1 1.0
CHEM 465 - Physical Chemistry Lab 2 1.0
CHEM 495 - Senior Seminar 1.0
CHEM 514 - Inorganic Chemistry 3.0
CHEM 518 - Advanced Inorganic Laboratory 2.0
CHEM 594R - General Seminar - *You may take once* 0.5

Requirement 2 — Complete 6 Courses

MATH 112 - Calculus 1 4.0
MATH 113 - Calculus 2 4.0
MATH 213 - Elementary Linear Algebra 2.0
MATH 215 - Computational Linear Algebra 1.0
PHSCS 121 - Intro to Newtonian Mechanics 3.0
PHSCS 220 - Intro Electricity & Magnetism 3.0

Requirement 3 — Complete 1 of 2 Options

Complete one of the following advanced options:

Option 3.1 — Complete 1 Course

CHEM 455 - Synthesis & Qual Organic Analy 4.0

Option 3.2 — Complete 2 Courses

CHEM 521 - Instrumental Analysis Lecture 2.0
CHEM 523 - Instrumental Analysis Lab 2.0

Requirement 4 — Complete 12.0 hours

After consulting with an advisor, complete 12 hours from the following. NOTE: Only one of Bio 130 or CELL 120 can be applied to this requirement. NOTE: With approval, certain other 300-level and above courses in the allied fields of physics, statistics, engineering, and biology may be taken to satisfy this requirement. NOTE: Any course not taken to satisfy Requirement 3 can be taken to satisfy Requirement 4.

BIO 130 - Biology 4.0
CELL 120 - Science of Biology 3.0
CHEM 384 - Biochem Methods 1.0
CHEM 397R - Mentored Outreach Svc Learning - *You may take up to 3.0 credit hours* 0.5v

CHEM 455 - Synthesis & Qual Organic Analy 4.0
CHEM 482 - Mechanisms of Molecular Biol 3.0
CHEM 496R - Academic Internship - *You may take up to 3.0 credit hours* 0.5v
CHEM 498R - Capstone Experience - *You may take up to 3.0 credit hours* 0.5v
CHEM 521 - Instrumental Analysis Lecture 2.0
CHEM 523 - Instrumental Analysis Lab 2.0
CHEM 552 - Advanced Organic Chemistry 3.0
CHEM 553 - Advanced Organic Chemistry 3.0
CHEM 555 - Organic Spectroscopic Ident 2.0
CHEM 563 - Reaction Kinetics 3.0
CHEM 565 - Intro to Quantum Chemistry 3.0
CHEM 567 - Statistical Mechanics 3.0
CHEM 569 - Fundamentals of Spectroscopy 3.0
CHEM 581 - Biochemistry 3.0
CHEM 584 - Adv Biochemistry Methods 1 3.0
CHEM 586 - Adv Biochemistry Methods 2 3.0
CHEM 596R - Special Topics in Chemistry - *You may take up to 3.0 credit hours* 0.5v
HONRS 499R - Honors Thesis - *You may take up to 3.0 credit hours* 0.5v
PHSCS 123 - Intro to Waves, Optics, and Thermo 3.0

Recommended Courses are not required to complete the program

Recommended Courses: Phscs 225; Stat 201.

Note: Elective courses, beyond the requirements above, should be selected in consultation with an advisor. The following should be given consideration: advanced chemistry, foreign languages (especially French, German, Japanese, and Russian), biological sciences, computer science, engineering, mathematics, physics, statistics.

REGISTRATION ADVISEMENT

We want to assist students in their academic pursuit toward an undergraduate degree. Students are encouraged to complete an average of 15 credit hours each semester or 30 credit hours each year, which could include spring and/or summer terms. Taking fewer credits substantially increases the number of semesters to graduate.

New students should attend the chemistry and biochemistry session during New Student Orientation, where they can meet with a faculty advisor and review their planned registration. Transfer or mid-year incoming students should meet with an advisor prior to the add/drop deadline of their first semester, which usually follows the first week of class.

The department recommends a review of progress and planned registration with a faculty advisor in the semester when 30, 60, and 90 hours are completed. However, academic advisement is available to all majors at **any** point in their academic career. Contact the department advisement office to schedule an appointment with a faculty advisor: in person C104 BNSN; by phone 801-422-6269; by email suemort@chem.byu.edu

MENTORED RESEARCH/EXPERIENTIAL LEARNING

We strongly encourage our majors to participate in mentored learning and

receive credit toward completing their major requirements. Approximately 80% of our faculty conduct independent, externally funded research and invite undergraduates to participate in on-campus mentored learning opportunities. Students initiate contact with a faculty whose research interests them. Upon acceptance to participate in a research lab, students enroll in a series of mentored research courses (CHEM 297R, 497R) throughout their academic career, culminating in a capstone research experience (CHEM 498R). Contact the department advisement center for additional information: 801-422-6269; C104 BNSN; suemort@chem.byu.edu.

THE DISCIPLINE

The Chemistry Bachelor of Science degree is the preferred degree for chemistry majors (approved by the American Chemical Society), especially those who desire an advanced degree (MS or PhD) in chemistry. It also provides excellent preparation for individuals in preprofessional programs (e.g., medicine, dentistry, business administration, or law).

Chemists and biochemists study the fundamental processes that govern the natural world, including atomic structure and how atoms interact to form molecules and materials. They study the mechanisms of chemical processes, including those that underpin living systems such as the transfer of information from DNA to RNA to proteins. They work to develop simplifying models (theories) that permit the correlation and explanation of observations about the behavior of life to the structure of rocks and minerals.

Chemistry and biochemistry provide an essential foundation for the medical sciences, engineering (especially chemical engineering), electronics, energy, environmental sciences, materials science, pharmacy, and virtually all manufacturing processes.

Chemistry and biochemistry are active branches of science that are vital to human existence. Inasmuch as the field embraces all aspects of the material world, it is subdivided into five areas of interest. Examples of these diverse areas include the regulation of protein synthesis, cellular signal transduction at the molecular level and proteomics (biochemistry), design and synthesis of medicinal compounds, catalysts and polymers (organic chemistry), design and synthesis of new molecular structures and materials (inorganic chemistry), spectroscopic study of energy transfer and molecular structures (physical chemistry), and analysis of medicinal compounds, biological materials, and contaminants or trace elements found in the environment (analytical chemistry).

Chemistry and biochemistry involve far more than test tubes and beakers. They include sophisticated methodologies such as recombinant DNA technology, working with a variety of instruments such as mass spectrometers, calorimeters, chromatographs, ultracentrifuges, lasers, X-ray diffractometers, electron microscopes and nuclear magnetic resonance spectrometers, all of which are used by undergraduate chemistry and biochemistry students at BYU. Computers also play an important role in these disciplines, with applications ranging from simulation of molecules and their interactions to the collection and analysis of data. The chemistry and biochemistry curricula are both rigorous and intellectually rewarding.

CAREER OPPORTUNITIES

Graduates in chemistry and biochemistry obtain positions in education and many different industries, performing analysis, synthesis, characterization, observation, and modeling. Those who work hard, are creative, and have intellectual curiosity are in particular demand. The discipline also provides an excellent preprofessional course of study for those interested in medicine, dentistry, law, and business.

MAP DISCLAIMER

While every reasonable effort is made to ensure accuracy, there are some student populations that could have exceptions to listed requirements. Please refer to the university catalog and your college advisement center/department for complete guidelines.

DEPARTMENT INFORMATION

Department of Chemistry and Biochemistry Advisement

Brigham Young University C-104 BNSN
Provo, UT 84602
Telephone: (801) 422-6269

ADVISEMENT CENTER INFORMATION

Computational, Mathematical & Physical Sciences College Advisement Center

Brigham Young University N-181 ESC
Provo, UT 84602
Telephone: (801) 422-2674

BYU Chemistry BS

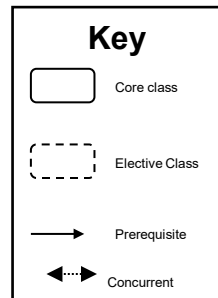
Requirements / Prerequisites 2024-2025 Academic Year

Major (76 Hours)

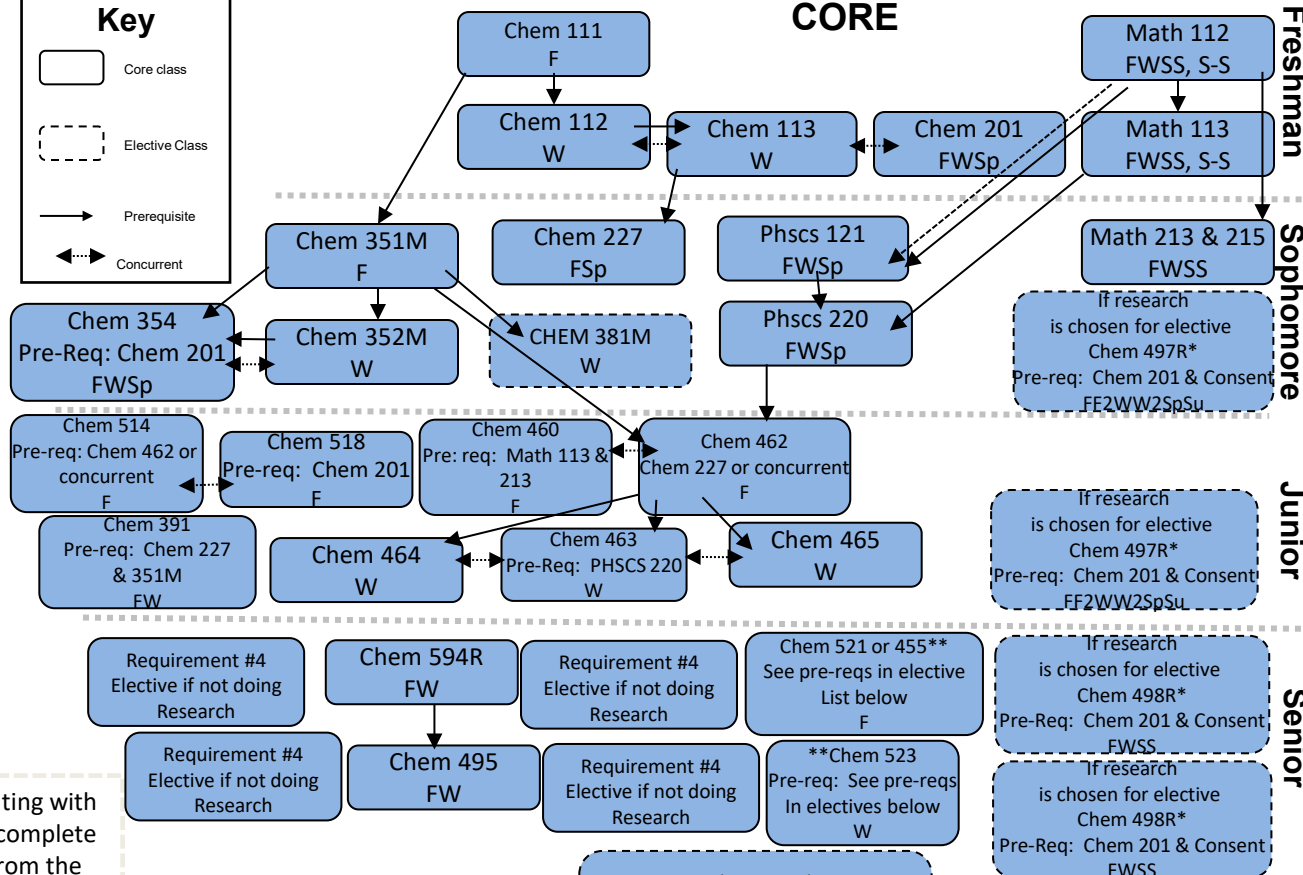
1. Complete the following: Chem 111, Chem 112, Chem 113, Chem 201, Chem 227, Chem 351M, Chem 352M, Chem 354, Chem 381M, Chem 391, Chem 460, Chem 462, Chem 463, Chem 464, Chem 465, Chem 495, Chem 514, Chem 518, Chem 594R
2. Complete the following: Math 112, Math 113, Math 213, Math 215, Phscs 121, Phscs 220
3. Complete either Chem 455 or Chem 521 & 523.
4. After consulting with an advisor, complete 12 hours from the following: Bio, 130, Cell 120, Chem 384, Chem 397R, Chem 455, Chem 482, Chem 496R, Chem 498R, Chem 521, Chem 523, Chem 552, Chem 553, Chem 555, Chem 563, Chem 565, Chem 567, Chem 569, Chem 581, Chem 584, Chem 586, Chem 596R, HONRS 499R, Phscs 123

Minor (20.5-21.5 Hours)

1. Complete one of the following options:
 - a. Chem 111, Chem 112, Chem 113.
 - b. Chem 105, Chem 106, Chem 107.
2. Complete two courses from the following: Chem 351, Chem 352, Chem 357, Chem 462, Chem 463, Chem 467, Chem 468, Chem 481.
3. Complete Chem 201.
4. Complete two hours from the following: Chem 353, Chem 354, Chem 355, Chem 464, Chem 465.
5. Complete 1 of the following courses: Chem 227 or Chem 455.



CORE



After consulting with an advisor, complete 12 hours from the following to fulfill requirement #4.

- *Bio 130 or CELL 120 FWSS (depending on class)
- Chem 482 Pre-Req: Chem 381M Or Chem 481 W
- CHEM 384 Chem 201 & Chem 227 See department
- Chem 397R Pre-req: Chem 111, Chem 112, & Chem 113 When taught: Contact Dept
- Chem 455 Pre-Req: Chem 354 & Chem 201 F
- Chem 496R Pre-req: Chem 201 & Instructor's consent FWSpSu
- Chem 498R* Pre-Req: Chem 201 & Consent FWSS
- Chem 521 Pre-Req: Chem 462 & PHSCS 220 E
- Chem 523 Pre-Req: Chem 201 & 521 W

- Chem 552 Pre-Req: Chem 352 (M), Chem 462 & Chem 463 (or 468) E
- Chem 553 Pre-Req: Chem 352(M) W
- Chem 555 F
- Chem 563 Pre-Req: Chem 462 & Chem 463 Contact Department

- Chem 565 Pre-Req: Chem 462 W
- Chem 567 Pre-Req: Chem 462 & 463 Contact Department
- Chem 569 Pre-Req: Chem 462 or Chem 468 E
- Chem 581 Pre-Req: Chem 482 E

- Chem 584 Pre-Req: Chem 227, Chem 381M, & Chem 384 F
- Chem 586 Pre-Req: Chem 584 W
- Chem 596R Pre-Req: None, Contact Department
- Honrs 499R FWSpSu
- PHSCS 123 Pre-req: PHSCS 121, Calculus FWSp

With approval, certain 300-level and above courses in allied fields of physics, statistics, engineering, and biology

*Enrolling in CHEM 497R and 498R gives students an opportunity to be mentored in a faculty's research lab and receive class credit. Enrollment in 497R can be repeated for several successive semesters, usually followed by 498R. Permission is required from the faculty member. Contact the department office for specific details.

If research is chosen for elective Chem 497R* Pre-req: Chem 201 & Consent_FF2WW2SpSu

If research is chosen for elective Chem 497R* Pre-req: Chem 201 & Consent_FF2WW2SpSu

If research is chosen for elective Chem 498R* Pre-Req: Chem 201 & Consent_FWSS

If research is chosen for elective Chem 498R* Pre-Req: Chem 201 & Consent_FWSS

Please note: When Taught is subject to change.
Only Bio 130 or Cell 120 may be used, not both.
Guide only—please consult MyMAP for full requirements.

** Take either Chem 521 & 523 or 455 for the required class(s). The other course(s) may be used towards the 12 credits of electives.

handshake

BYU's own job board. Employers who want to hire BYU graduates or offer internships to current students post job openings to this website and students apply. Just like LinkedIn, employers can view student profiles and students can network as they apply for jobs and internships



Login to handshake.byu.edu >>> BYU Net ID

**you do not need to create an account, just sign in with you BYU information*

HOW TO MAKE THE MOST OUT OF HANDSHAKE:

1. COMPLETE YOUR PROFILE

- Upload your resume and it will auto-fill in your profile
- Completed profiles tailor your Handshake experience
- Information from your transcript is already uploaded
- Fill in the Summary/Bio section
- Fill in your past jobs and experiences, including all the bullet points you use on your resume
- Add a professional headshot and background photo

Remember: every word in your profile will be searchable by students and employers

4. EXPLORE FELLOW STUDENTS

- “Students” tab
- Search for fellow BYU students to view their profiles and job positions (Facebook stalking... “networking”)

5. ATTEND EVENTS

- The “Events” tab will be your key to attending info sessions, interviews, and Career Fairs
- The “Calendar” tab under “Events” will show you what events are coming soon
- Make sure to save events you are interested in or RSVP so you do not forget to attend
- Spread the word to your friends on social media

6. DOWNLOAD HANDSHAKE APP

- Search: “Handshake” not “Handshake Career Services”
- Input your BYU e-mail address: netID@byu.edu (it will forward emails to the e-mail you have on file with BYU)
- Handshake will send you a link via e-mail to enable your account in the app
- Navigate the app to perform all the functions of the website that have been previously mentioned

7. VISIT THE CAREER STUDIO

- Freshen up your resume, cover letter, or LinkedIn
- Receive networking help
- Practice interviewing with a mock interview
- Meet with a full-time Career Counselor in your field

8. GET A JOB, RING THE BELL

- Once you're hired, stop by the Career Studio to ring our Victory Bell and get a picture for the Victory Board



employers are
5X MORE LIKELY
to view a profile that has
at least one job/skill/organization

2. APPLY FOR JOBS

- Search for job titles, employers, or skills
- Apply for interesting jobs that meet your skill set

3. RESEARCH COMPANIES

- Under the “Jobs” Tab there is an “Employers” Tab
- Search for keywords or locations to find companies that are the right fit for you
- Plan to attend their info sessions on BYU Campus, connect with them at Career Fairs, or set up informational interviews to learn more

Remember: when looking at companies or jobs, Handshake will tell you what other BYU students have worked there. Use this resource to network and discover more information!

Possible Careers with a Chemistry major

(Not a comprehensive list)

*Usually requires a graduate degree

Agricultural engineer	Lab safety manager	Physiologist*
Agricultural research	Medical Doctor*	Process chemist
Agronomist*	Medical Physician*	Professor*
Biotechnologist	Microbiologist*	Prosthetist and orthotist*
Chemical hygiene officer	Neurologist*	Quality assurance & control manager
Chemical safety engineer	Nuclear physicist*	Regulatory compliance officer
Chemist	Nurse/Nurse Practitioner*	Respiratory therapist
Dentist*	Orthodontics*	Sanitation engineer
Environmental chemist	Paleontologist*	Surgeon*
Environmental health & safety technician	Patent examiner	Surgical technologist
Forensic scientist	Patent lawyer*	Technical sales & marketing rep
Health physicist*	Peptide chemist*	Toxicologist*
Independent consultant	Perfusionist	Urologist*
Industrial chemist	Pharmacist*	Veterinarian*
Industrial manager	Phlebotomist	Veterinary technician
Internist*	Physiatrist*	Zoologist*
Junior high or high school teacher	Physical therapist*	
Lab Researcher	Physician assistant*	
	Physician executive*	
	Physician scientist*	

For a more comprehensive list, scan here:



Companies that have hired our graduates

Neutraceutical, International	ThermoFisher Scientific	Northrop Grumman
Schlumberger	NIH	Jacobs
IBC Advanced Technologies	Beyond Labz	Clorox Company
MoxTek	Pfizer	Edwards Life Sciences
NuSkin	Eli Lilly	Octant
Millenniata	Intel	Huntsman Cancer Institute
Intel	Recursion	DOE National Lab

