

## CHEMISTRY

The chemistry undergraduate major and its specialized options at North Dakota State University provides opportunities for personal achievement and professional training that are typically not available at many universities. Faculty teach all major courses. Students use state-of-the-art instrumentation in their laboratory courses. Many students get involved in fundamental and applied research with faculty research groups and have growth experiences commonly available only to graduate students. Future secondary chemistry and science teachers can participate in supervised laboratory teaching and peer mentoring programs.

### Background Information

Industry and graduate schools are well aware of the quality of undergraduate education at NDSU and actively seek out our graduates. Scholarships, fellowships and employment in research groups or in supervised teaching activities can cut the already modest cost of an NDSU education by one-half or more.

### The Program

The Department of Chemistry and Biochemistry is fully accredited by the American Chemical Society (ACS) and offers programs leading to an ACS-certified Bachelor of Science degree. Options in biochemistry or coatings and polymeric materials can be added to the curriculum. A pre-professional option for those planning on medical, dental and other professional schools is also available. A chemistry major may be combined with secondary school teacher certification with as little as one additional semester for student teaching.

The prescribed curriculum provides a solid grounding through classroom and laboratory work in all of the main areas of chemistry. Major laboratory courses are designed to utilize the latest synthesis and characterization methods and employ advanced, computer-interfaced instrumentation.

Our pre-professional option includes the course work in biological and biochemical sciences that easily meets the requirements of medical, dental and other health-related professional schools. A chemistry major offers rigorous pre-professional education, as well as a back-up option in case career plans change in the future.

### Research Opportunities

Almost every chemistry faculty member is heavily involved in forefront research, and undergraduates are encouraged to participate in that research. Students gain important skills and are exposed to the excitement of the hunt for new knowledge. This research experience often helps students define career goals more sharply.

### Career Opportunities

People often think of the professional chemist as one who stands at a workbench in an industrial laboratory carefully manipulating chemicals or instruments. A lot of chemists are employed this way. This is often quite satisfying since many people are drawn to chemistry because they enjoy laboratory work. There are, however, many other tasks besides laboratory research in which a chemist may engage, and many different careers for which he or she can prepare for a degree in chemistry. A chemist may be employed in government, business, industry or education. Besides basic and

applied research (the lab bench), an industrial chemist may be involved in the production, technical service (assisting people who use products), national and international marketing and sales, or management and corporate planning. Some chemists prefer self-employment through small business or consulting firms.

Analytical chemists are in demand for services to other departments within a chemical company, for quality control in large and small concerns, and for environmental monitoring by industrial, governmental and private organizations. Organic chemists, also in great demand, study new pharmaceuticals, polymers and other compounds. Materials chemists are needed by all high-tech industries for their synthesis and characterization skills. Inorganic chemists work on the full range of synthesis, characterization and application of chemical compounds. Physical chemists model chemical structures and reactions, and design experiments and equipment to study them. The Department of Chemistry and Biochemistry offers specialized education and training in each of these fields.

A degree in chemistry can serve as excellent preparation for careers in medicine, dentistry and other health professions. A chemistry degree also can lead to law school, and perhaps a career in patent law, a very demanding and in-demand technical profession. About half of NDSU's chemistry graduates go on to graduate or professional schools. Almost all the rest go directly into industry. Average entry-level salaries for chemistry graduates is \$45,300 to \$81,400, based on 2016 data from [www.payscale.com](http://www.payscale.com). For chemists who have advanced degrees, salary and opportunities are often much greater.

### Faculty and Facilities

The Department of Chemistry and Biochemistry has 17 faculty members. All of the faculty have doctorate degrees from leading universities.

The Department of Chemistry and Biochemistry's teaching and research facilities are located in two connected buildings—Ladd and Dunbar Halls. Some additional laboratories are located in the A. Glenn Hill Center, and Quentin Burdick Building. Students are trained in the use of state-of-the-art equipment, some of which is duplicated at only a few sites in the world. Some undergraduate students are trained to use several powerful and sophisticated laser systems, and some have even built lasers that were put directly to work on research projects. Nuclear magnetic resonance spectrometry, X-ray diffraction and fluorescence are as up-to-date as one would expect to find at any major research university. Theoretical chemistry researchers use some of the most powerful computers on the NDSU campus.

### High School Preparation

Ideal high school preparation for a chemistry major includes four years each of English and mathematics, and a year each of biology, chemistry and physics. Experience with personal computers is also desirable. Strong writing and communication skills are as important to success in chemistry as they are in any technical field.

## Financial Support

A number of endowed scholarships and fellowships are available to highly qualified applicants. The Department of Coatings and Polymeric Materials offers industry-funded scholarships and fellowships to chemistry majors interested in taking the coatings and polymeric materials option. In addition, more than half of the students majoring in chemistry are engaged in research and earning substantial portions of their living expenses. Financial support for research experiences is provided principally by grants and contracts of faculty researchers, various summer Research Experiences for Undergraduates (SURE) programs, and national scholarship and fellowship programs, such as the Goldwater Foundation. Since 1992, nine students in the department have been awarded Goldwater Fellowships, which cover all educational expenses. Students interested in secondary school teaching have additional funding opportunities as laboratory teaching assistants and discussion leaders in a peer-tutoring program known as Supplemental Instruction. These positions not only provide an opportunity for help toward meeting expenses but also in adding relevant experience to resumes.

## Chemistry Plan of Study

Please note this is a sample plan of study and not an official curriculum. Actual student schedules for each semester will vary depending on start year, education goals, applicable transfer credit, and course availability. Students are encouraged to work with their academic advisor on a regular basis to review degree progress and customize an individual plan of study.

<b>First Year</b>			
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
ENGL 110 College Composition I	4	ENGL 120 College Composition II	3
CHEM 150 Principles of Chemistry I and 160 Principles of Chemistry Laboratory I	4	COMM 110 Fundamentals of Public Speaking	3
MATH 165 Calculus I	4	CHEM 151 Principles of Chemistry II and 161 Principles of Chemistry Laboratory II	4
BIOL 150 General Biology I	3	MATH 166 Calculus II	4
Gen Ed Social & Behavioral Sciences/Gen Ed Cultural Diversity	3	Gen Ed Humanities & Fine Arts	3
	<b>18</b>		<b>17</b>
<b>Second Year</b>			
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
CHEM 341 Organic Chemistry I	3	CHEM 342 Organic Chemistry II	3
CHEM 353 Majors Organic Chemistry Laboratory I	1	CHEM 354 Majors Organic Chemistry Laboratory II	2
MATH 128 Introduction to Linear Algebra	1	MATH 266 Introduction to Differential Equations	3
MATH 259 Multivariate Calculus	3	PHYS 252 University Physics II and 252L University Physics II Laboratory	5
PHYS 251 University Physics I and 251L University Physics I Laboratory	5	Gen Ed Wellness	2
Gen Ed Humanities & Fine Arts/Gen Ed Global Perspectives	3		
	<b>16</b>		<b>15</b>
<b>Third Year</b>			
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
CHEM 431 Analytical Chemistry I and 431L Analytical Chemistry I Laboratory	5	CHEM 365 Physical Chemistry II	3
CHEM 364 Physical Chemistry I	3	CHEM 380 Chemistry Junior Seminar	1
CHEM 471 Physical Chemistry Laboratory	2	Electives	9
ENGL 324 Writing in the Sciences	3		
Gen Ed Social & Behavioral Sciences	3		
	<b>16</b>		<b>13</b>
<b>Fourth Year</b>			
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
BIOC 460 Foundations of Biochemistry and Molecular Biology I and 460L Foundations of Biochemistry I Laboratory	4	CHEM 425 Inorganic Chemistry I	3
CHEM 432 Analytical Chemistry II and 432L Analytical Chemistry II Laboratory	4	CHEM 429 Inorganic Chemistry Laboratory	2
Electives	6	CHEM 491 Seminar	2
	<b>14</b>	Electives	6
			<b>13</b>
<b>Total Credits: 122</b>			

View NDSU equivalencies of transfer courses at: [www.ndsu.edu/transfer/equivalencies](http://www.ndsu.edu/transfer/equivalencies)

## For Further Information

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