CHEMISTRY

What can I do with this major?

AREAS	EMPLOYERS	STRATEGIES
ANY CHEMISTRY DISCIPLINE Product Development Process Development Analysis Testing Biotechnology (using living organisms or cell processes to make useful products) Consulting Quality Assurance/Quality Control Management Environmental Analyses Forensics	Government: U.S. Food and Drug Administration U.S. Environmental Protection Agency U.S. Department of Agriculture National Institutes of Health Public health departments Industries: Chemical, pharmaceutical, biotechnology, food, feed, cosmetics, agricultural, environmental, petroleum, consumer products Private research labs and organizations Colleges and universities Consulting firms	Develop strong verbal, written, teamwork and problem-solving skills. Choose courses with laboratory components to build experimental and instrumentation skills. Gain experience in area of interest through internships, research with professors and/or complete a senior research project. Consider taking a course in grant writing. Earn master's degree in chemistry for advanced positions, greater responsibility and higher pay. Obtain Ph.D. to direct research projects and lead research teams. Enroll in undergraduate research early in your college career. (Chem200+Chem400)

Only some of the areas of specialization follow.
Most students specialize at the graduate level.

AGRICULTURAL CHEMISTRY Agricultural Production: crops and livestock Agrichemicals Development: herbicides, pesticides, fungicides, fertilizers, etc. Agrichemicals Testing Environmental Testing Regulation	Government: U.S. Department of Agriculture U.S. Environmental Protection Agency U.S. Food and Drug Administration Food and feed industries Agricultural chemical companies Plant and animal breeders and growers	***Agricultural chemistry addresses the chemical processes associated with the production, protection and usage of crops and livestock.*** Maintain awareness of current environmental issues including policy, conservation, and industry trends. Pursue coursework in biology, biochemistry, water chemistry, soil chemistry, geology, etc. to support understanding of environmental impact. Develop strong verbal and written communication skills for work with interdisciplinary teams. Seek related experience through co-ops, internships, or part-time jobs in specialized area of interest.

AREAS	EMPLOYERS	STRATEGIES
ANALYTICAL CHEMISTRY Qualitative Analysis Quantitative Analysis Instrumentation Design Experimental Design Separations (mass spectrometry, chromtography) Spectroscopy Chemometrics/statistics	Government: U.S. Environmental Protection Agency U.S. Food and Drug Administration National Labs Industries: Chemical, pharmaceutical, biotechnology, food, feed, cosmetics, agricultural, environmental, petroleum, consumer products, legal, medical Private research labs and organizations Chemical instrumentation companies Consulting firms	***Analytical chemistry focuses on determining the composition and structure of matter and has applications to all areas of chemistry.*** Seek extensive laboratory and research experience along with courses in quantitative, qualitative and instrumental analyses. Pursue advanced instrumentation and computer skills along with knowledge of statistics. Develop attention to detail and strong problem solving skills. Take electives in your field of interest, as some employers seek candidates with expertise in particular areas of analysis such as environment or pharmaceuticals. Obtain knowledge of fundamental business principles to assist in meeting the goals of industry.
BIOCHEMISTRY Healthcare Pharmaceuticals Environment Agriculture Food Science Cosmetics Forensics	Government: Centers for Disease Control and Prevention U.S. Environmental Protection Agency U.S. Food and Drug Administration U.S. Department of Agriculture Food Safety and Inspection Service Industries: chemical, pharmaceutical, waste management, environmental, food, feed, healthcare, biotechnology, plant and animal breeders and growers Private research laboratories and organizations Public health departments Hospital laboratories Commercial medical laboratories	***Biochemistry references the study of chemical properties within living systems.*** Consider taking courses to specialize in biology, molecular biology, genetics, biophysics or biophysical methods, as this field is often linked to other disciplines. Develop excellent laboratory and computer skills. Strong oral and written communications skills are necessary for working with teams of scientists. Seek undergraduate research opportunities with professors and plan to complete internships related to your area of interest. Join related professional organizations such as the American Society for Biochemistry and Molecular Biology.

AREAS	EMPLOYERS	STRATEGIES
CHEMICAL ENGINEERING Bulk Chemicals (mass produced large quantities) Fine Chemicals (custom-produced small quantities) Consumer Products Biotechnology Pharmaceuticals Electronics Environmental Safety and Health Fuels and Energy Conversion Materials	Government: U.S. Department of Energy U.S. Environmental Protection Agency U.S. Nuclear Regulatory Commission U.S. Department of Agriculture Industries: Agrichemicals, industrial bulk and fine chemicals, food, biotechnology, pharmaceutical, cosmetics, environmental textiles, petroleum, consumer products, automotive, pulp and paper, rubber, electronics, plastics, energy Private research labs and organizations	***Discipline combines chemistry and engineering to solve problems involving the use or production of chemicals.*** Consider double majors in chemistry and engineering. Develop exceptional communication and interpersonal skills for work on multidisciplinary teams. Attention to detail is crucial. Pursue experimental design, data interpretation and problem solving competence through coursework and research with professors. Seek internship or co-op experiences in the chemical engineering field. Join professional associations such as American Institute of Chemical Engineers to maintain current knowledge of opportunities in the field. Research Fundamentals of Engineering (FE) exam requirements, as this exam is typically the first step in becoming a Professional Engineer (PE). Consider a concentration in Sustainability to pursue field in Green (or Sustainable) Chemistry.
GEOCHEMISTRY Analysis Testing Environmental Regulation Environmental Remediation	Government: U.S. Department of Energy U.S. Geological Survey U.S. Office of Surface Mining Environmental management firms Consulting firms Oceanographic research institutes Mining companies	***Geochemistry includes study of the liquids, gases and mineral deposits of rock to guide scientific and industrial applications.*** Build a strong background in analytical, physical and environmental chemistry. Pursue courses in hydrology, sedimentology, toxicology, plant ecology, oceanography for environmental work. Plan to take courses with laboratory components and seek geochemistry part-time jobs and internships. Maintain awareness of current environmental issues including policy, conservation, and industry trends for entry into environmental management or remediation. Geochemists working with the oil industry may work in areas where deposits are found. The industry is subject to fluctuation making some work contractual. Join the Geological Society of America and other environmental organizations.

AREAS	EMPLOYERS	STRATEGIES
INORGANIC CHEMISTRY Analysis Testing Synthesis Environmental Remediation Energy Information Technology Consumer Products	Government: U.S. Department of Agriculture U.S. Environmental Protection Agency U.S. Geological Survey National Aeronautics and Space Administration Industries (inorganic materials): Mining, microchip, computer manufacturers, ceramics, superconductive metals Private research labs and organizations Environmental management firms Consulting firms	***Inorganic chemistry addresses the behavior of inorganic and organometallic compounds and how these materials can be modified for product applications.*** Prepare a strong background in inorganic chemistry with classes in physics, materials science and chemical engineering. Develop excellent communication skills for work with other disciplines including materials scientists, physicists and engineers. Seek experimental design and analytical research chemistry experience. Inquire about grant writing training, as the inorganic chemistry job market is tight, and some scientists are required to solicit monetary support for their work through government, industry and private foundations.
MATERIALS SCIENCE Metallurgy Ceramics Plastics/Polymers Composites Semiconductors and Electronic Materials Optical Materials Biomaterials Nanomaterials Extraction/Synthesis Processing	Government: U.S. Department of Energy U.S. Department of Defense National Aeronautics Space Administration National Labs Industries: Automobile, appliance, electronic, aerospace equipment, machinery, biomedical, communications, sporting goods, security, paint/coatings, alternative energy production Private research labs and organizations Airlines, railroads and utility companies	***Materials science focuses on the development of new materials and the improvement of existing ones.*** Earn an undergraduate degree in chemistry, engineering or physics for entry into the materials science field. Build laboratory and research experience as an undergraduate through coursework, projects with professors, co-ops or internships. Develop effective problem solving, communication and teamwork skills for collaborating with professionals in other fields. Seek undergraduate membership in professional organizations such as the American Society for Materials to learn more about opportunities in the field and to build professional contacts. Plan to pursue a graduate degree to specialize in a particular material, process or characterization technique.

AREAS	EMPLOYERS	STRATEGIES
ORGANIC CHEMISTRY Synthesis Healthcare Pharmaceuticals Materials Science Consumer Products Biotechnology Agrichemicals Food Science Fuels	Government: U.S. Department of Agriculture U.S. Department of Energy U.S. Environmental Protection Agency Industries: Chemical, pharmaceutical, biotechnology, food, feed, cosmetics, agriculture, environment, petroleum, consumer product, rubber, plastics, elastomers, detergents, paints/coatings, dyes Private research labs and organizations	***Organic chemistry is the study of the structure, properties and reactions of natural and synthetic carbon-containing compounds to create uses for existing or new materials.*** Cultivate attention to detail, curiosity and problem solving skills. Strong oral and written communication skills are also essential. Seek chemistry-related research experience through work with professors, co-ops, internships or part-time jobs. Develop effective technical laboratory skills for work with instruments including chromatography, spectroscopy, nuclear magnetic resonance. Knowledge of computer programs with 3D modeling capabilities may be advantageous.
PHYSICAL CHEMISTRY Materials Science Chemical Biology Nanoscale Science Molecular Modeling Quantum Computing Biosensors	Government: U.S. Department of Energy U.S. Department of Defense National Aeronautics Space Administration National Labs Industries: Pharmaceutical, electronics, ceramics, plastics, surfactants and colloids, environmental, consumer products Private research labs and organizations	***Physical chemistry is a broad, interdisciplinary field applying techniques and theories from physics to study chemical systems.*** Develop a strong background in chemistry, math and physics. Interest in study at the atomic level is central to physical chemistry. Enhance knowledge of quantum mechanics, thermodynamics, kinetics, structure, electronics and optics through additional classes. Seek coursework with laboratory components to build technical skills with both instruments and computers. Pursue physical chemistry internships, co-ops and/or research projects to learn about practical applications of the field and increase job marketability.

AREAS	EMPLOYERS	STRATEGIES
POLYMER CHEMISTRY Synthetic Macromolecules Biological Macromolecules Analysis Testing Synthesis Blending Compounding Consumer Products	Government: U.S. Department of Defense National Aeronautics Space Administration National Labs Industries: Adhesives, paints/coatings, synthetic rubber, synthetic fibers, agricultural chemicals, packaging, automobile, aerospace equipment, biomedical	***Polymer chemistry is an interdisciplinary field in which molecular structures are modified by chemical processes to develop a material's functionality.*** Plan to take courses in polymers to specialize but be aware that most polymer chemists begin as organic chemists. The market for environmentally-friendly products will likely influence this field in upcoming years. Develop effective communication skills for work on teams with scientists and industry professionals. Seek exposure to business fundamentals, as polymer chemistry deals closely with end-products. Gain research experience through internships, part-time employment and summer jobs.
EDUCATION Teaching Educational Research	Universities and colleges Medical and other professional schools Public and private schools, K-12	Develop excellent communication skills, verbal and written. Gain experience working with age group of interest through volunteering and tutoring. Become skilled in the use of computers and laboratory equipment. Certification is required for K-12 school teachers and varies by state. Master's degrees may be sufficient for teaching at community or two-year institutions. Pursue Ph.D. for teaching opportunities at colleges and universities. Gain teaching experience as a Teaching Assistant during junior and senior years.

AREAS	EMPLOYERS	STRATEGIES
HEALTHCARE		
Medicine Dentistry Optometry Podiatry Pharmacy Veterinary Medicine Allied Health: Occupational Therapy Physical Therapy Medical Technology Nuclear Medicine	Hospitals Medical centers and clinics Private and group practice Health networks Nursing homes Rehabilitation centers Colleges or universities Correctional facilities Large corporations Armed services Government agencies State and local public health departments	Research various fields within healthcare to determine a particular career goal. Plan to attend medical school or other related graduate program. Meet with a pre-health advisor periodically to evaluate progress toward goal. Maintain an outstanding grade point average, particularly in the sciences. Seek experiences in hospital or healthcare settings through volunteering, shadowing, part-time positions, or internships. Join related student organizations. Demonstrate leadership abilities. Secure strong faculty recommendations for graduate and professional school admissions. Develop a back-up plan in case medical/graduate school admission is denied.
OTHER PROFESSIONAL OPPORTUNITIES		
Sales Marketing Technical Writing Scientific Journalism Scientific Illustration Intellectual Property/Patent Law Informational Specialists	Medical/Pharmaceutical companies Product development departments in industries: Chemical, pharmaceutical, biotechnology, food, feed, cosmetics, agricultural, environmental, petroleum, consumer products Publishing firms: Books, scientific and research journals, technical press, large newspapers Software firms Regulatory agencies Environmental management organizations Waste management firms Law firms Legal departments of corporations Private practice Colleges and universities Special libraries	Develop strong verbal and written communication, interpersonal and organizational skills. Supplement chemistry degree with coursework or minor in chosen field (e.g., business, journalism, technical writing). Seek sales experience through internships, part-time work or summer jobs. Become familiar with desktop publishing and other software packages for scientific journalism and technical writing opportunities. Pursue experience writing for a school or local newspaper. Join related student organizations (e.g., American Marketing Association, Financial Management Association, Public Relations Student Society of America, Society for Technical Communication, etc.) Obtain an MBA or Ph.D. for advancement. To pursue a J.D., participate in mock trial and pre-law associations, learn law school admissions process. Earn master's in library and information science, M.L.I.S., for college, university and specialized librarian positions, and join Special Libraries Association, Chemistry Division.

GENERAL INFORMATION

- Undergraduate degree is sufficient for entry-level positions such as lab coordinator/manager, research assistant, product testing or analysis, technical sales or service representative.
- Maintain high grade point average and secure strong recommendations for graduate school admission.
- Undergraduate research experience at home institutions and/or NSF-REU summer programs at other universities is highly beneficial for future career steps
- Master's degree is sufficient for most applied research positions, industrial work and some community college teaching.
- Ph.D. degree required for university teaching and advanced positions in management and research and development. Postdoctoral experience may be required for research positions in industry, universities and government.
- In the United States, doctoral students typically receive full tuition waivers and annual salaries to attend graduate school because there is a strong need for Teaching Assistants in General Chemistry classes. There is also federal and industrial monetary support available for research.
- Develop strong computer, mathematics and science skills/knowledge. Consider electives in computer science, math, physics, engineering, business, public speaking and writing.
- Seek coursework and opportunities to enhance laboratory skills.
- Obtain part-time, volunteer, co-op, internship and/or research opportunities with professors to gain relevant experience.
- Develop contacts at government laboratories, research organizations or in industry. Schedule informational interviews to learn about the profession and specific career paths.
- Read scientific journals to stay current on relevant issues in the field and join related professional organizations.