



What do you know about

## Careers in Chemistry

A degree in chemistry opens up a large number of careers paths related to chemistry that you could work in. These careers are largely based on what your knowledge of chemistry is applied to.

Analytical Chemistry is the science of obtaining, processing, and communicating information about the composition and structure of matter. In other words, it is the art and science of determining what matter is and how much of it exists.

Biochemistry is the study of the structure, composition, and chemical reactions of substances in living systems. Biochemistry emerged as a separate discipline when scientists combined biology with organic, inorganic, or physical chemistry and began to study such topics as how living things obtain energy from food, the chemical basis of heredity, and what fundamental changes occur in disease. Biochemistry includes the sciences of molecular biology; immunochemistry; neurochemistry; and bioinorganic, bioorganic, and biophysical chemistry.

Colloid and Surface Chemistry studies states of matter characterized by a large surface area per unit volume or unit mass. Colloid and surface scientists seek to understand the chemical and physical behavior of various combinations of gases, liquids, and solids. Not a day goes by without some aspect of colloid and surface science affecting us, such as the biomolecular and physiological interactions that sustain life; the blue skies we see on a beautiful day; the processed foods we eat; the medicines and cosmetics we use; the CD's, DVD's we store computer data and video programs on; the soaps and detergents we use for cleaning; and other everyday products we take for granted.

Environmental Chemistry studies the fate of chemicals in the environment. This often involves the effects of human pollution on our environment. Environmental chemist often study things like water and air quality and how to improve them. Environmental chemistry includes the sciences of biology, analytical chemistry, organic chemistry, biochemistry, geology, and inorganic chemistry.

Inorganic Chemistry is the study of the synthesis and behavior of inorganic and organometallic compounds. It has applications in every aspect of the chemical industry—including catalysis, materials science, pigments, surfactants, coatings, medicine, fuel, and agriculture. Inorganic chemists are employed in fields as diverse as the mining and microchip industries, environmental science, and education.

Materials Science is an applied science concerned with the relationship between the structure and properties of materials. Chemists who work in the field study how different combinations of molecules and materials result in different properties. They use this knowledge to synthesize new materials with special properties. Materials scientists are generally employed by industry or in laboratories where the focus is on developing product-related technologies.

Organic Chemistry deals with the structure, properties, and reactions of carbon-containing compounds. It is highly creative. Chemists, in general, and organic chemists in particular create new molecules never before proposed which, if carefully designed, may have important properties for the betterment of the human experience. For example, organic chemistry involves new drug synthesis and discovery.

Physical Chemistry aims to develop a fundamental understanding at the molecular and atomic level of how materials behave and how chemical reactions occur, knowledge that is relevant in nearly every area of chemistry. These scientists study diverse topics, from biochemistry to materials properties to the development of quantum computers. Physical chemistry often serves as the link between physics and chemistry.

Polymer Chemistry develops polymers so they can be used to make ingredients for products with unique physical and chemical properties. They manipulate large, complex molecules and capitalize on the connections between their molecular structure and the properties that make them useful.

*Other fields:*

Agricultural Chemistry, Catalyst, Chemical Education, Chemical Engineering, Chemical Information Specialists, Chemical Sales, Chemical Technology, Consumer Product Chemistry, Forensic Chemistry, Food and Flavor Chemistry, Geochemistry, Hazardous Waste Management, Medicinal Chemistry, Pulp and Paper Chemistry, R&D Management, Science Writing, Textile Chemistry, Water Chemistry



# ACS

16	110	109
S	Ds	Mt
32.065	[281]	[268]
sulfur	damstadtium	meitnerium

For more information about careers in chemistry please go to [www.acs.org](http://www.acs.org) and search for careers.

# The Job Market in Chemistry

## Education

What kind of job you get in the chemistry field will depend on a large number of variables. One variable is the level of education. Most chemist in the field will have either a bachelor's of science degree, a master's degree, or a PhD in chemistry.

- **Bachelor's degree:** A bachelor's degree will typically take four years and can be achieved at many different institutions. A bachelor's degree in chemistry will prepare you to work in the chemical field by giving you knowledge of chemistry and experience in handling chemicals and chemical instrumentation. Students who graduate with a bachelor's degree in chemistry can work in industrial labs working on testing, analysis, safety, or other jobs that may involve chemicals.

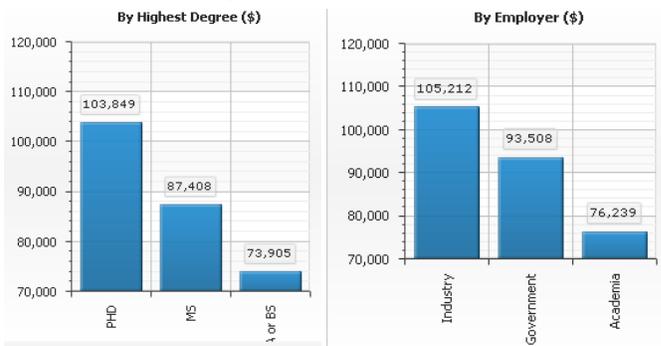
- **Master's degree:** A master's degree will typically take two-three additional years after a bachelor's degree has been obtained. Students who receive a master's degree are exposed to additional chemistry knowledge and first hand exposure to chemistry research. Often a student with a master's degree will work towards a specialization in a field of chemistry. Students who graduate with a master's degree in chemistry can work in industrial labs much like someone with a bachelor's degree, but will often be given more of a supervisory role. They can also work in national labs or go on to teach or do research in academic institutions.

- **PhD degree:** A PhD (Doctorial) degree will typically take four-six additional years after a bachelor's degree. Often a student will achieve a master's degree first, and then get a PhD after two-three more years of study. A PhD degree is typically in a specialized field of chemistry. During their PhD studies a student will be heavily exposed to research in their field, developing and completing a research project. Students who achieve a PhD in chemistry have a wide range of employment options. Most roles in industry or research labs would involve a supervisory position. A PhD degree also provides the option to head up teaching and research at an academic institution.



## Employer

The salary a chemist receives will largely depend on the level of education they have and what type of employer they have, as shown on the graphs below.



National Salary averages based on level of education (left graph) and type of employer (right graph). Source: [www.acs.org](http://www.acs.org)

- **Industrial jobs** can be the most rewarding financially, but may be more difficult to obtain in some cases. Jobs in industry may related to product development, product testing, sample analysis, chemical safety, monitoring, sales, chemical disposal, and chemical patents. Many companies that are not thought of as being part of the chemical industry still employ people with chemistry backgrounds to help monitor chemicals used in their industry and make sure they are handled and disposed of properly.

- **Government jobs** can be related to a wide range of fields. Probably the most common and most closely associated to chemistry are those related to government research. These jobs are often in national research labs and are under the jurisdiction of government agencies such as the National Science Foundation, Department of Energy, National Institute of Health, and Department of Defense.

- **Academic jobs** involve positions at universities and colleges across the country. Depending on the institution and the position, jobs may range from research scientist to instructor. Professors at universities and colleges develop research programs that often have researchers, graduate students, and undergrad students working on cutting edge research. Often academic research is supported financially by the same government agencies that support national research labs.

For more information about careers in chemistry please go to [www.acs.org](http://www.acs.org) and search for careers.

Chemistry at South Dakota School of Mines and Technology

Dr. Justin Meyer  
Department of Chemistry  
501 E. Saint Joseph St.  
Rapid City, SD 57701-3995

Phone: 605-394-2431  
Fax: 605-394-1232  
E-mail: [Justin.Meyer@sdsmt.edu](mailto:Justin.Meyer@sdsmt.edu)



# ACS

16 S 32.065 sulfur	110 Ds [281] darmstadtium	109 Mt [268] meitnerium
-----------------------------	------------------------------------	----------------------------------