

# CHEMISTRY

Chemistry is a major branch of the physical sciences and involves the study of substances and energy. It focuses on their composition, characteristics, changes, reactions, uses, and their benefits and dangers to humankind. Chemists investigate properties of matter and the laws that come into play when elements combine.

## JOB OUTLOOK

The majority of approximately 100,000 US chemists are employed in manufacturing firms that produce plastics and synthetic materials, drugs, soaps and cleaners, paints, industrial organic chemicals, and other miscellaneous chemical products. State and local governments, primarily in health and agriculture, and Federal agencies, chiefly in the Departments of Defense, Health and Human Services, and Agriculture currently employ chemist. Many others work for research and testing services and educational institutions.

Employment of chemists is expected to grow about as fast as the average for all occupations through the year 2005. In July 1997, the American Chemical Society reported that "with overall unemployment in the U.S. at its lowest level since 1973, job status and salaries of chemists improved considerably after several rough years."

Students obtaining employment immediately upon graduation are usually those with the best college records and a willingness to relocate to find a job. Some jobs also require education beyond a bachelors' degree.

## TYPICAL SKILLS & CHARACTERISTICS

### Analytical Skills

Attending to data with accuracy  
Ability to conduct research  
Ability to develop theories  
Ability to make decisions  
Curiosity  
Follow through skills  
Good vision/manual dexterity  
Intellectual capacity  
Observation skills  
Proficiency in reading & memorizing

Perform experiments  
Perseverance  
Process data  
Remain objective  
Science and math ability  
Technological skills  
Use formulas  
Oral and written communication  
Organizational capability  
Work independently and in groups

## JOB & CAREERS

**The following are actual job titles of people who have graduated with an undergraduate degree in Chemistry although some of these positions may require education beyond a bachelors.**

### **AGRONOMIST**

Improves the yield and quality of crops for human consumption. Develops new growing methods and new varieties of plants.

### **ANESTHESIOLOGIST**

Studies and applies anesthesia during surgical procedures. May be a licensed physician or a specially trained registered nurse.

### **ASSAYER**

Qualitatively or quantitatively analyzes the composition of ore or drugs to determine the composition.

### **ASTRONOMER**

Studies the positions, distributions, motion and composition of celestial bodies.

### **BIOCHEMIST**

Biochemists study the chemistry of living organisms to increase scientific knowledge and develop ways to apply this knowledge in areas such as medicine, veterinary science, agriculture, environmental science and manufacturing. They may study the chemical processes which occur within individual cells; study the processes, such as digestion and growth,

which involve whole organisms; undertake detailed chemical analysis using sophisticated instruments and techniques; prepare or supervise the preparation of scientific reports and papers for journals based on observations and experiments.

### **CEPHLOMETRIC ANALYST**

Traces head x rays and illustrates cosmetic result of proposed orthodontic treatment: Traces frontal and lateral head x-rays onto transparent paper, using template, compass, protractor, and knowledge of cranial-facial skeletal structure. Traces lower teeth from occlusal x-ray or photograph to locate key points defining true curve of lower dental arch. Records cephalometric measurements to prepare data for computer analysis, using electronic data recording equipment. Compiles data from tracings and computer plot sheets to illustrate results of proposed surgery or other orthodontic treatment.

### **CERAMIC ENGINEER**

Provides technical expertise relating to all aspects of ceramic processing leading to the manufacture of Solid Oxide Fuel Cells. Develops methodology for mixing and extruding novel powder precursors and slurry formulation; troubleshoots ceramic manufacturing processes; provides effective solutions for scale up; develops, validates and implements innovative concepts for the manufacture of solid oxide fuel cells; provides and implements cost reduction measures; adapts plans to continual evolution of fuel cell manufacturing processes.

### **CHEMICAL ENGINEER**

Chemist involved in the production of chemicals, usually on a large scale.

### **CHEMICAL OCEANOGRAPHER**

Oceanographers study all aspects of oceans, including their boundaries and contents. They plan and execute investigations record the details of experiments and expeditions; develop and test theories and models; prepare papers and reports; respond to criticisms of their conclusions; help establish policy on coastal and marine environments and resources and manage related human activities.

### **CHEMISTRY TECHNOLOGISTS**

Technologists understands underlying scientific principles of laboratory testing and technical, procedural, and problem-solving aspects. They have general comprehension of factors affecting health and disease; recognizes importance of proper test selection, numerous causes of discrepant test results (patient and laboratory), deviations of test results, and ethics including result confidentiality. They correlate abnormal laboratory data with pathologic states, determines validity of test results, and need for additional tests. They understand and enforce safety regulations, use statistical methods and apply business and economic data in decision-making.

### **COLOR DEVELOPMENT CHEMIST**

Develops formulas for paper-coloring dye and prepares directions for mixing it with pulp to produce colored paper to specifications or customer's samples. Determines composition of color using a spectrophotometer.

### **COMPUTER SOFTWARE ENGINEER**

Software engineers research, design, develop, and test operating systems-level software, compilers and network distribution software. They work with medical, industrial, military, communications, aerospace, business, scientific and general computing applications to set operational specifications and formulate and analyze software requirements.

### **CONSUMER PROTECTION**

Specialist who usually works for a government agency to alert consumers of potential fraud or danger from patented products or processes.

### **COOPERATIVE EXTENSION AGENT**

Works for a local or state government to provide quality, relevant, outreach education programs and services to specific locale. He or she provides unbiased, research-based information, educational programs, and technical assistance in the following core service areas: youth development; nutrition, diet and health; environmental stewardship; community and economic development; fisheries; agriculture.

### **CRIME LAB ANALYST**

Works in a crime lab to decipher evidence for ma variety of sources using a variety of processes and techniques. Usually hired by law enforcement agencies.

### **CRIMINOLOGIST**

An individual who studies crime, crime scenes and criminal to understand behaviors and thought processes that may possibly lead to understanding the criminal mind for purposes of preventing future crime and incarceration of current criminals.

### **CYTOTECHNOLOGIST**

Cytotechnologists examine human cell samples under the microscope, looking for early signs of cancer and other diseases, tracing clues to disease in the specially stained cell cytoplasm and nucleus and issues the final report on specimens. They work independently with little supervision.

### **DENTIST**

Person trained and licensed in diagnosis, treatment and prevention of gum and tooth disease.

### **DIETITIAN**

Person trained in the study of diet and nutrition. Usually works for hospitals, nursing homes, schools.

### **EDUCATOR**

Teaches in elementary, middle or high schools, Universities and Colleges and medical schools.

### **ENTOMOLOGIST**

Studies insects, their habitats and contributions to life.

### **ENVIRONMENTAL RESEARCHER**

Researches, develops, and presents information regarding environmental issues in fields such as: earth, marine, and atmospheric sciences; mining; forestry; public works; and parks, wildlife, and water management. Works for government agencies, consulting firms, citizens' groups, research laboratories, scientific associations, and industry.

### **ENVIRONMENTAL ENGINEER**

Environmental engineers are charged with designing and planning prevention, control and remediation of environmental health hazards.

### **ENVIRONMENTAL HEALTH SPECIALIST**

Involved with the prevention of disease and the protection/promotion of human well-being, exemplified by environmental health activities intended to contain hazardous elements and the control of nuisance which interfere with the comfort and enjoyment of life and the use of the environment by all who live in, or visit a particular environmental locale.

### **FDA INSPECTOR**

Food and Drug Administration inspection of premises where such items are made and sold to ensure compliance with federal, state and local consumer protective regulations.

### **FIRE PROTECTION ENGINEER**

Implements and maintains operations and engineering functions for an institutional fire protection/prevention program; reviews plans and specifications for structural construction/modifications for required safety and fire protection features; provide technical guidance and code interpretations; plan and conduct fire prevention program, including fire prevention instruction and drills; maintain files regarding fires and other disasters to determine the cause, contributing factors, extent and amount of loss.

### **FOOD and DRUG ANALYST**

Researches the chemical construction of specific food/drugs and makes sure the formulation is safe for human/animal consumption. Looks for contraindications of drugs and reactions with other medications/foods/beverages, etc..

### **FOOD SCIENCE TECHNICIAN**

Science technicians use the principles and theories of science and mathematics to solve problems in research and development and to help invent and improve products and processes.

### **FORENSIC CHEMIST**

Works with wide range of state-of-the-art instruments that analyze many types of evidence; provides expert testimony in courts; conducts research in development of new methods of analysis; develops intelligence data used to determine trends in international trafficking of illicit drugs; and supports DEA Special Agents, Task Force Officers and Diversion Investigators in their investigations.

**GENETIC COUNSELOR**

This counselor advises individuals who do have or who are at high risk of having or transmitting genetically transmitted conditions, informing them of risks and options associated with particular genetic conditions.

**GEOLOGIST**

One who studies the origin, history and the structure of the earth.

**GEOPHYSICIST**

One who studies the physics of geothermal phenomena.

**HOSPITAL ADMINISTRATOR**

One who is responsible for the daily operation of a hospital, medical or trauma center. Oversees finances, personnel, adherence to regulations and codes, and accreditation issues.

**HYDROLOGIST**

Hydrologists study the distribution of water , including flow and discharge of water along a river or over a dam. On the Great Lakes, they are interested in lake levels and how these levels affect commerce, shoreline erosion, etc. Hydrologist, often team with other scientists and are employed by federal agencies like NOAA, United States Geological Survey, or the US Army Corps of Engineers. Others work as researchers in universities or engineering firms that design and build sewers, channels, and other water related structures.

**INDUSTRIAL/INSTITUTIONAL BUYER**

This person acts as a chemicals purchasing agent for industries and institutions that use them in the creation of products.

**INORGANIC CHEMIST**

Under general supervision, performs specific inorganic chemical analyses of a variety of inorganic compounds such as sludge, wastewater, vapors using qualitative and quantitative analyses and interprets laboratory data.

**LAWYER**

One who give legal advice to clients and represents them in court or other legal proceedings.

**METALLURGIST**

This person is a scientist who deals with extracting metals from ores and creating useful objects from them.

**MOLECULAR BIOLOGIST**

Scientist who deals with the structure and function of essential molecules, such as nucleic acids; especially in their roles in heredity.

**OCCUPATIONAL SAFETY SPECIALIST**

This person is responsible for interpreting local, state and federal regulations concerning worker safety in specific environments, and in seeing that those regulations are adhered to by institutional/industrial employees.

**OPTOMETRIST**

Professional who examines the eyes and prescribes lenses or corrective functions for visual defects.

**PATENT AGENT**

This individual is familiar with patent laws and represents an inventor in the process of applying for a patent of a process or invention.

**PATENT ATTORNEY**

This person is a lawyer who represents a client in litigation or preventing litigation concerning patent rights and infringements.

**PATENT EXAMINER**

This individual conducts research on behalf of the patenting entity to determine if there is an original product or process or if previous patents exist when a product or process is submitted for patenting.

**PERFUMER**

Develops and produces perfumes from combinations of essences of various plants and herbs.

**PESTICIDE DEVELOPER**

Creates chemical deterrents for variety of insect pests to ensure safety of crops. Works for chemical company.

**PETROLEUM ENGINEER**

This person is involved in the exploration and production activities of petroleum at the upstream end of the energy sector. The diverse topic covered by petroleum engineering are geology, geochemistry, geophysics, oil drilling, well logging, well completion, oil and gas production, reservoir development and pipelining.

**PHARMACIST**

Works for hospitals, drug stores, medical clinics that dispense medication. Evaluates medication orders for appropriateness of drug, dosage, potential interactions, route of administration and stability; recommends therapy changes as appropriate; maintains patient database for medical history, clinical and laboratory data, and concurrent medication; collaborates with healthcare teams to provide clinical and technical support; documents communication with physicians, nurses, other members of the healthcare team and patients and their family members in the medical record; obtains and maintains required documentation; implements policies and procedures for the safe procurement, storage, distribution and use of drugs and biologicals, as well as disposal of drugs

**PHARMASEUTICAL SALES**

Works for drug companies, calling on physicians in geographic locations to inform them of advances in drug therapy, educate them about new drugs, provide samples for physicians to use with appropriate patients and assess the value of the drug on specific conditions. They also serve as a reference for information about specific drugs.

**PHYSICIAN****PLASTICS ENGINEER**

Plastics engineers set up and monitor the machines used to produce plastic products.

**POLLUTION CONTROL**

This individual works for local, state and federal governments to monitor pollution output of manufacturing companies and develop means to control in compliance of government regulations.

**PRODUCT DEVELOPMENT MANAGER**

Oversees Industrial designers who design and develop specific products for use in homes, businesses and industry.

**PRODUCT TESTER**

This individual may work for the product developer to work out any malfunction in the product under a variety of circumstances before it is released to the open market. He or she may also work independent of the manufacturer to test a product under similar conditions to ensure unbiased evaluation.

**PSYCHIATRIST**

Psychiatrists diagnose and provide treatment for people with emotional, mental and behavioural problems. They also study how the brain and nervous systems function and interact with people's environments and the way they think, feel and behave.

**PUBLIC HEALTH EDUCATOR**

Public health educators provide health education, health promotion, health assessment and disease prevention educations and activities in schools and the community.

**QUALITY ASSURANCE MANAGER**

This person assess the product/process to determine if quality is standard under the same set of circumstances. Manages the quality department, including department scheduling, engineering and change control and ensures inspection procedures and quality inspections are completed on all jobs. Maintains quality records. Ensures all quality procedures are being followed during engineering, design and on the shop floor and non-conformance is documented and necessary corrective actions are put in place.

**RADIOLOGIST**

Diagnostic radiologists diagnose diseases of the human body using x-rays, ultrasound, radiowaves, Magnetic Resonance Imaging (MRI), Computer Tomography (CT), which gives cross sections of internal body parts, and scintigraphy, the injection and tracking of radioactive solution in the body.

**SCIENTIFIC PHOTOGRAPHER**

This person is a professional photographer who specializes in the photographing of scientific phenomena. He or she may use magnifying equipments to photograph what is visible under a microscope.

## **SOIL SCIENTIST**

Soil scientists study soils, including soil types and processes, and the implications of soil use.

## **SPECIFICATIONS WRITER**

This individual develops specifications for products or processes and communicates them to vendors.

## **SYSTEMS ANALYST**

Systems analysts research the systems and procedures an organisation uses, and decide if and how computer applications could be used to improve them.

## **VECTOR CONTROL ASSISTANT**

Assists public health staff in activities concerned with identification, prevention, and control of vectors (disease-carrying insects and rodents): Carries and sets up field equipment to be used in surveys of number and type of vectors in area. Sets traps and cuts through brush and weeds to obtain specimens of vector population for use in laboratory tests, using sweep. Prepares, mounts, and stores specimens, following instructions of supervisor. Prepares reports of field surveys and laboratory tests based upon information obtained from personnel involved in specific activities, for use in planning and carrying out projects for prevention and control of vectors.

## **WEBSITES FOR CHEMISTRY**

AIRSITE <http://airsite.unc.edu/>

Alpha Chisigma.org <http://www.alphachisigma.org/>

Agricultural Biotech Chemical Job List <http://www.nationjob.com/ag>

American Academy of Forensic Sciences <http://www.aafs.org>

American Society of Crime Laboratory Directors <http://www.ascl.org>

American Chemical Society <http://www.chemistry.org/portal/chemistry>

ChemJobs.net [www.chemjobs.net](http://www.chemjobs.net)

Biotechnology jobs and information [www.bioview.com](http://www.bioview.com)

chemistry jobs [www.chemistryjobs.com](http://www.chemistryjobs.com)

Nature jobs [www.nature.com/naturejobs](http://www.nature.com/naturejobs)

Chemistry job search site [www.sciencejobs.com](http://www.sciencejobs.com)

JobSpectrum from the American Chemical Society [www.cen-chemjobs.org](http://www.cen-chemjobs.org)

MonsterTRAK <http://www.monstertrak.com>

Science Careers: comprehensive databases to search for jobs, career interests, employer profiles, career fairs and job descriptions [www.sciencecareers.org](http://www.sciencecareers.org)

Chemistry internships at Pfizer <http://www.pfizer.com>

Job search engine for chemistry <http://www.ajob4scientists.com/>

Chemistry and Industry [www.chemind.org](http://www.chemind.org)

ChemSeer <http://www.chemseer.com/chemistryjobs/vacancies.shtml>

## **WEBSITES: CAREER INFO**

Royal Society of Chemistry: advice on choosing a career and job options for chemists  
<http://www.rsc.org/lap/educatio/careers.htm>

Career Experience: career matching, career descriptions, free registration to access database and useful sites <http://careerexperience.com>

Chemist (Occupational Outlook Handbook) <http://stats.bls.gov/oco/ocos049.htm>

ChemPointers <http://www.chem.ucla.edu/chempointers.html>

Career Converter <http://6steps.monster.com/step1/careerconverter>

Career Fields <http://career.berkeley.edu/Infolab/CareerFields.stm>

UTK <http://career.utk.edu/majors/majors/asp>

Resources [http://guide.symplicity.com/resources/profession\\_index\\_a\\_z.php](http://guide.symplicity.com/resources/profession_index_a_z.php)

<http://www.bw.edu/career/programs/wcidwami>

KSU <http://www.ksu.edu/acic/career/careerbymajor.html>

NCSU <http://www.ncsu.edu/career/students/major.htm>

Delaware <http://www.udel.edu/CSC/mrk.html>

RSC's Chemical Science Network [www.chemsoc.org](http://www.chemsoc.org)

Chemistry: The Profession [www.chemistrycoach.com/chemistryprofession.htm](http://www.chemistrycoach.com/chemistryprofession.htm)

Chemical & Engineering New Online <http://pubs.acs.org/cen/index.html>

Chem Web: searchable database and publications for students <http://chemweb.com/jobs>

Society of Chemical Industry <http://www.soci.org>

Center for Chemical Education <http://www.terrificscience.org/>

Forensic Chemistry Network <http://www.geocities.com/CapeCanaveral/4329/>

## MISCELLANEOUS

Chemistry Web Index <http://www.yahoo.com/Science/Chemistry/>

Chemical Week (online magazine) <http://www.chemweek.com/>

ChemFinder.com <http://chemfinder.camsoft.com/>

Chemistry careers [www.du.edu/career](http://www.du.edu/career)

## HIRING ORGANIZATIONS

Agricultural scientist  
Beverage companies  
Chemical industries  
Colleges/schools  
Consulting firms  
Cosmetic companies  
Distributors of equipment  
Engineering firms  
Food/product companies

Textile manufacturers  
Utility companies  
Lumber companies  
Medical laboratories  
Medical libraries  
Medical supply companies  
Newspapers/ magazines  
Petroleum companies  
Pharmaceutical companies

Government agencies  
Hospitals  
Technical libraries

Professional/technical journals  
Research firms

## PROFESSIONAL ORGANIZATIONS

American Chemical Society  
Department of Career Services  
1155 16th St., NW  
Washington, DC 20036  
1-800-227-5558 fax: (202) 872-4615  
[www.acs.org](http://www.acs.org)  
email: [help@acs.org](mailto:help@acs.org)

American Institute of Chemists  
515 King St., Ste. 420  
Alexandria, VA 22314  
(703) 836-2090 fax: (703) 684-6048  
[www.thealc.org](http://www.thealc.org)  
email: [AICoffice@theaic.org](mailto:AICoffice@theaic.org)

Association of Consulting Chemists & Chemical Engineers  
PO Box 297  
Sparta, NJ 07871  
(973) 729-6671 fax: (973) 729-7088  
[www.chemconsult.org](http://www.chemconsult.org)  
email: [info@chemconsult.org](mailto:info@chemconsult.org)

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