

CHEMISTRY... NOW WHAT?

Quick Facts: Chemists and Materials Scientists	
2020 Median Pay	\$80,680 per year
Entry-Level Education	Bachelor's degree
Work Experience in a Related Occupation	None
On-the-job Training	None
Number of Jobs, 2019	93,700
Job Outlook, 2019-29	5% (Faster than average)
Employment Change, 2019-29	4,300

[Found on the Occupational Outlook Handbook, <https://www.bls.gov/ooh/life-physical-and-social-science/chemists-and-materials-scientists.htm>]

What Chemists and Materials Scientists Do

Chemists and materials scientists study substances at the atomic and molecular levels and analyze the ways in which the substances interact with one another. Chemists and materials scientists work in laboratories and offices. They typically work full time and keep regular hours. Chemists and materials scientists need at least a bachelor's degree in chemistry or a related field. However, a master's degree or Ph.D. is needed for many research jobs.

What is Chemistry?

Chemistry is the study of matter, its properties, how and why substances combine or separate to form other substances, and how substances interact with energy. Chemists improve many products, from the food we eat and the clothing we wear to the materials with which we build our homes. Chemistry helps to protect our environment and searches for new sources of energy. There are five main branches of chemistry, each of which has many areas of study.

Analytical chemistry uses qualitative and quantitative observation to identify and measure the physical and chemical properties of substances. In a sense, all chemistry is analytical.

Physical chemistry combines chemistry with physics. Physical chemists study how matter and energy interact. Thermodynamics and [quantum mechanics](#) are two of the important branches of physical chemistry.

Organic chemistry specifically studies compounds that contain the element [carbon](#). Carbon has many unique properties that allow it to form complex chemical bonds and very large molecules. Organic chemistry is known as the "Chemistry of Life" because all of the molecules that make up living tissue have carbon as part of their makeup.

Inorganic chemistry studies materials such as metals and gases that do not have carbon as part of their makeup.

Biochemistry is the study of chemical processes that occur within living organisms.

What do chemists do in chemistry and related fields?

Biochemists and biophysicists study the chemical and physical principles of living things and of biological processes.

Chemical technicians use special instruments and techniques to assist chemists and chemical engineers.

Food chemists improve the quality, safety, storage and taste of our food. Food chemists may work for private industry to develop new products or improve processing. They may also work for government agencies such as the Food and Drug Administration to inspect food products and handlers to protect us from contamination or harmful practices. Food chemists test products to supply information used for the nutrition labels or to determine how packaging and storage affects the safety and quality of the food. Flavorists work with chemicals to change the taste of food. Chemists may also work on other ways to improve sensory appeal, such as enhancing color, odor or texture.

Environmental chemistry is an interdisciplinary study that involves both analytical chemistry and an understanding of environmental science. Environmental chemists must first understand the chemicals and chemical reactions present in natural processes in the soil water and air. Sampling and analysis can then determine if human activities have contaminated the environment or caused harmful reactions to affect it. Water quality is an important area of environmental chemistry.

Forensic science technicians aid criminal investigations by collecting and analyzing evidence.

Agricultural chemists develop fertilizers, insecticides and herbicides necessary for large-scale crop production. They must also monitor how these products are used and their impacts on the environment. Nutritional supplements are developed to increase the productivity of meat and dairy herds. Agricultural chemists may work with the Department of Agriculture, the Environmental Protection Agency, the Food and Drug Administration or for private industry. Agricultural biotechnology is a fast-growing focus for many agricultural chemists. Genetically manipulating crops to be resistant to the herbicides used to control weeds in the fields requires detailed understanding of both the plants and the chemicals at the molecular level. Biochemists must understand genetics, chemistry and business needs to develop crops that are easier to transport or that have a longer shelf life.

Chemical engineering combines a background in chemistry with engineering and economics concepts to solve technological problems. Chemical engineers apply the principles of chemistry, biology, physics, and math to solve problems that involve the use of fuel, drugs, food, and many other products. They are involved in designing and operating processing plants, develop safety procedures for handling

dangerous materials, and supervise the manufacture of nearly every product we use. Industries require chemical engineers to devise new ways to make the manufacturing of their products easier and more cost effective. Chemical engineers work to develop new products and processes in every field from pharmaceuticals to fuels and computer components.

Geochemists combine chemistry and geology to study the makeup and interaction between substances found in the Earth. Geochemists may spend more time in field studies than other types of chemists. Many work for the U.S. Geological Survey or the Environmental Protection Agency in determining how mining operations and waste can affect water quality and the environment. They may travel to remote abandoned mines to collect samples and perform rough field evaluations, and then follow a stream through its watershed to evaluate how contaminants are moving through the system. Petroleum geochemists are employed by oil and gas companies to help find new energy reserves. They may also work on pipelines and oil rigs to prevent chemical reactions that could cause explosions or spills.

Who Could I Work For?

Educational Institutions	Hazardous Waste	Pulp And Paper Industries
Science Museums	Management	Chemical Laboratories
Quality Control Laboratories	Chemical Testing Companies	Agricultural Companies
Pharmaceutical / Biotech	Research Centers / Institutes	Professional Chemical
Mineral and Metal Industries	Cosmetic Companies	Societies
Hospital Research	Utility Companies	Textile Manufacturers
Laboratories	Chemical Distributors	Police Laboratories
Industrial Laboratories	Hospitals	Chemical Manufacturing
Food / Beverage Companies	Newspapers / Magazines	Petroleum Refineries
Health Protection Branches	Oil Companies	Government
Waterworks Departments	Chemistry Consulting Firms	Aerospace Companies
	Environmental Consulting	Technical Librarian

Where Might I Do An Internship?

UMass Amherst Chemistry majors have done field experience internships at the following sites:

Abbott Laboratories	EnerSys Energy	UMass Amherst Emergency
Amherst (Town of)	Infinity Pharmaceuticals	Medical Services
ARIAD Pharmaceuticals, Inc	MassPIRG	UMass Amherst
ArQule	Millennium Pharmaceuticals	Environmental Health &
Associates of Cape Cod	NuOrtho Surgical, Inc.	Safety
Campbell's Foods	Sanofi Group (Pasteur &	Walt Disney World
EMD Millipore	Genzyme)	Yankee Candle

What Can I Do With An Undergraduate Degree In Chemistry?

Chemist	Forensic Lab Analyst	Chemical Technologist
Quality Control Chemist	Pulp and Paper Chemist	Assayer
Laboratory Technician	Paint Formulation Chemist	Product Tester
Technical Sales Representative	Paper Product Developer	Production Chemist
Chemical and Drug Sales Representative	Chemical Information Specialist	Lab Coordinator
Consumer Protection Specialist	Occupational Health and Safety Officer	Chemical Analyst
Water Quality Analyst / Technician	Medical Laboratory Technician	Pest Control Technician
Technical Writer	Analytic Chemist	Textile Chemist
Aerosol Development Manager	Associate Chemist	Occupational Hygienist
Quality Assurance Chemist	Research Assistant	Geologist
Methods Development Chemist	Chemical Safety Officer	Color Development Specialist
Process Development Chemist	Clinical Technician	Environmental Engineer
Organic Mass Spectrometrists	Food and Drug Analyst	Geochemist
	Pollution Controller	Industrial Hygienist
	Information Analyst	Teacher
	Soil Tester	Crime Lab Analyst
	Laboratory Analyst	Dentist
		Medical Technologist

Chemistry majors learn to think creatively, troubleshoot complex problems, perform detailed analyses, and make decisions based on research. These skills are highly valuable in any workplace, and have applications in virtually every field. Not all graduates from chemistry programs go on to work as chemists, though. While many do work in a field closely related to chemistry, others choose to take a completely different path. Sales and teaching positions are among the most common career choices for those who pursue a career in an unrelated field.

It's very common for chemistry majors to attend graduate school after they complete their undergraduate studies. These graduates make great candidates for medical school, optometry school, dental school, pharmacy school, and veterinary school. Since chemistry majors develop strong research skills, they are also successful in law school, and many go on to work as patent lawyers.

Career Planning Resources & Websites

UMass Amherst CNS Career Center	cns.umass.edu/careers
UMass Amherst CNS Career Center	www.cns.umass.edu/careers
FOCUS2 Career and Education Planning	www.umass.edu/careers/planning for sign-in button
What Can I Do With This Major?	https://www.umass.edu/careers/planning

(Click on "What Can I do with this Major" icon on the right-hand column.)

Bureau of Labor Statistics Occupational Outlook Handbook	www.bls.gov/ooh/chemists
Bureau of Labor Statistics Occupational Outlook Handbook	https://www.bls.gov/ooh/chemical-technicians

O-Net: "Chemistry"	www.onetonline.org/find/quick?s=chemistry
Massachusetts Career Information System	http://masscis.intocareers.org
<i>(Click Mass Resident to login with "Amherst/01003" Then click "Occupations" or "Assessments")</i>	
* Amer Chem Society "Chemistry Careers"	www.acs.org/content/acs/en/careers
Organic Chemistry Resources Worldwide	www.organicworldwide.net
Science.gov Gateway to US Federal Science	www.science.gov

Chemistry Internships & Job Search Resources

* UMass Handshake Database of Internships & Jobs	https://umass.joinhandshake.com/
BioPharmGuy	https://biopharmguy.com/services/entrylevel.php
<i>Internships and Research Opportunities</i>	
* Chem Dept Research Experiences for Undergrads	www.umass.edu/chemistry/under
* Chem Dept Internships Resources	www.umass.edu/chemistry/undergrad
* Finding Independent Lab Research On Campus	www.umass.edu/biochem/undergraduate
* UMass Amherst Chemistry Undergraduate Research	www.chem.umass.edu/currentUndergrads
* Doing Your Own Independent Research at UMass	www.umass.edu/chemistry/undergr
* Office of Undergraduate Research and Studies (OURS)	www.umass.edu/ours
AAMC Summer Undergrad Medical Research Programs	www.aamc.org/members/great/61052
ACS Summer Undergrad Research Fellowships (SURF)	www.organicdivision.org/student-and
* Bio-Med Research Opps for Pre-Meds (BIG List)	http://people.rit.edu/gtfsbi/Symp/premed
Federal Government Undergrad STEM Internships	https://stemundergrads.science.gov/
Funded Summer STEM Research Opportunities	www.pathwaystoscience.org/programs
* Mass Life Sciences Center Internships	https://www.masslifesciences.com/internship
National Institute of Health (NIH) Fellowships	https://hr.nih.gov/jobs/scientific/
NIH Pathways Internship Program	https://hr.nih.gov/jobs/student/pathways

Chemistry Job Boards

Academic Jobs Online	http://academicjobsonline.org/ajo/chemistry
American Chemistry Council Jobs Board	www.americanchemistry.com/Jobs
American Chemistry Society Jobs Board	https://chemistryjobs.acs.org/jobs/
BioSpace	https://www.biospace.com/jobs
Chemical Jobs Recruiters	www.chemicaljobs.com
Chemistry Jobs	www.chemistryjobs.com
Chemistry Jobs	https://jobs.sciencecareers.org/jobs/chemistry/
Chemistry Research Jobs	www.researchgate.net/jobs
* Computational Chemistry List (CCL)	www.ccl.net/chemistry/announcements
Freelance Chemistry Opportunities	http://upwork.com/o/jobs/browse/skill/chem
Health & Human Services (HHS) Jobs	https://www.hhs.gov/careers/
I Hire Chemists	https://www.ihirechemists.com/
* Life Sciences Recruiters for multiple companies	www.propelcareers.com
LinkedIn Chemistry Jobs	https://www.linkedin.com/jobs

National Institute of Health (NIH) Jobs	https://hr.nih.gov/jobs/scientific
Nature Careers in Chemistry	https://www.nature.com/naturecareers/jobs
New Scientist Chemistry Jobs	https://jobs.newscientist.com/searchjobs
Northeast Section, Amer Chem Society (Advanced)	http://www.nesacs.org/careers.html
Organic Chemistry Portal	www.organic-chemistry.org/jobs
Science Magazine: Advanced Level Chem Jobs	https://jobs.sciencecareers.org/searchjobs
UMass Amherst Chemistry In-Dept Job Opportunities	https://www.umass.edu/chemistry/faculty

Chemistry Professional Organizations

American Association for the Advancement of Science	www.aaas.org
American Chemical Society	www.acs.org
American Physiological Society	www.the-aps.org
American Society for Biochem and Molecular Bio	www.asbmb.org
Association of American Medical Colleges	www.aamc.org
Biochemistry Society	www.biochemistry.org
Chem Industry Directories By Specialty	www.chemindustry.com/index
International Society of Pharmaceutical Engineers	www.ispeboston.org
Massachusetts Biotechnology Council	www.massbio.org
UC Santa Barbara Library of Chem Societies (<i>huge list</i>)	http://guides.library.ucsb.edu/content
Wikipedia List of Chemistry Societies	http://en.wikipedia.org/wiki/List_of_chemistry

Additional Resources

Best of the Web List of Science Job Sites	http://botw.org/top/Science/Employment
Boston & New England Biotech Companies	https://biopharmguy.com/links
Current Biotech & Life Sci Jobs	http://biopharmguy.com

General Job Search Engines

Glass Door	www.glassdoor.com/index.htm
Indeed	www.indeed.com
One-Stop Career Centers (search by zip code)	http://careeronestop.org/jobsearch/findjobs
SimplyHired	www.simplyhired.com

Important Transferable Qualities to Include On Your Resume

Analytical skills. Chemists must be able to conduct scientific experiments and analyses with accuracy and precision.

Critical-thinking skills. Chemists draw conclusions from experimental results through sound reasoning and judgment.

Interpersonal skills. Chemists typically work on research teams and need to be able to work well with others toward a common goal. Many also serve as team leaders and must be able to motivate and direct other team members.

Math skills. Chemists regularly use complex equations and formulas in their work, and they need a broad understanding of mathematics, including calculus and statistics.

Perseverance. Scientific research involves substantial trial and error, and chemists must not become discouraged in their work.

Problem-solving skills. Chemists use scientific experiments and analysis to find solutions to complex scientific problems.

Speaking skills. Chemists frequently give presentations and must be able to explain their research to others.

Writing skills. Chemists write memos, reports, and research papers that explain their findings.

What Do Employers Look For? (NACE 2020 Job Outlook for Students)

