BIOCHEMISTRY & MOLECULAR BIOLOGY...NOW WHAT?

Quick Facts: Biochemists and Biophysicists

<table>
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<tr>
<th>Category</th>
<th>Details</th>
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<tr>
<td>2020 Median Pay</td>
<td>$94,270 per year</td>
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<tr>
<td>Entry-Level Education</td>
<td>Doctoral degree</td>
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<tr>
<td>Work Experience in a Related Occupation</td>
<td>None</td>
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<tr>
<td>On-the-job Training</td>
<td>None</td>
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<tr>
<td>Number of Jobs, 2019</td>
<td>34,600</td>
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<tr>
<td>Job Outlook, 2019-29</td>
<td>4% (As fast as average)</td>
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<td>Employment Change, 2018-28</td>
<td>1,400</td>
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What is Biochemistry? Biochemistry explores the chemical processes within and related to living organisms, and focuses on processes happening at a molecular level. It is a laboratory based science that uses chemical knowledge and techniques, to understand and solve biological problems. Biochemistry covers a range of scientific disciplines, including genetics, microbiology, forensics, plant science and medicine. It focuses on what’s happening inside our cells, studying components like proteins, lipids and organelles. It also looks at how cells communicate with each other, for example during growth or fighting illness. Biochemists and biophysicists study the chemical and physical principles of living things and of biological processes.

What do biochemists do? Biochemists seek to understand how the structure of a molecule relates to its function, allowing them to predict how molecules will interact. They provide new ideas and experiments to understand how life works, support our understanding of health and disease, and contribute innovative information to the technology revolution. Working on interdisciplinary teams with experts in other fields, such as physics, chemistry, healthcare, computer science, and engineering, biochemists use electron microscopes, lasers, and other laboratory technologies to carry out research, scientific experiments, and analysis. For example, they use computer modeling software to determine the three-dimensional structures of proteins and other molecules. Biochemists and biophysicists involved in biotechnology research use chemical enzymes to synthesize recombinant DNA.

Biochemists and biophysicists work in basic and applied research. Basic research is conducted without any immediately known application; the goal is to expand human knowledge. Applied research is directed toward solving a particular problem.

Biochemists, sometimes called molecular biologists or cellular biologists, may study the molecular mechanisms by which cells feed, divide, and grow. Others study the evolution of plants and animals, to understand how genetic traits are carried through successive generations.

Biophysicists may conduct basic research to learn how nerve cells communicate or how proteins work. Biochemists and biophysicists who conduct basic research typically must submit written grant proposals to
colleges and universities, private foundations, and the federal government to get the money they need for their research.

Biochemists typically do the following:
- Plan and conduct complex projects in basic and applied research
- Manage laboratory teams and monitor the quality of their work
- Isolate, analyze, and synthesize proteins, enzymes, DNA, and other molecules
- Research the effects of substances such as drugs, hormones, and food on tissues and biological processes
- Prepare technical reports, research papers, and recommendations based on their research
- Present research findings to scientists, engineers, and other colleagues

What is Molecular Biology? Cell and Molecular Biology is an interdisciplinary field that bridges the fields of chemistry, structure and biology as it seeks to understand life and cellular processes at the molecular level, paying special attention to how molecules control a cell’s activities and growth. With a focus on coordination of the activities that form the essential systems of a living cell, molecular biologists work to define the underlying mechanisms of human disease, to identify new therapeutic targets responsible for disease, and to lay a foundation for the development of novel therapies. This field is rapidly providing important new insights into the basis and treatment of numerous human diseases, including cancer, diabetes, cardiomyopathies, retinal degeneration, muscular dystrophy, cystic fibrosis, and mental retardation.

What does a molecular biologist do? Molecular biologists conduct research and academic activities. The research component involves the study of biological structures in well-equipped laboratories with advanced technology to help them explore complex molecular structures and their particular functions. The equipment may include microscopes, lab centrifuges, computers with specific software that allows them to analyze obtained data, and many more. The reason why research in molecular biology is so important is because the concepts discovered in this manner can be applied to mainstream biology, medicine, wildlife study and protection of endangered animals, food industry, pharmaceutical industry and environment protection.

A molecular biologist can also conduct academic work such as teaching, workshops, practical demonstrations in universities, at conferences, and in governmental agencies. This component requires the ability to explain the molecular concepts of biology in an easy-to-understand way for people who may need such knowledge in their field of study and work. At some point in their careers, doctors, environmental experts, biologists, bio-engineers and other professionals have been trained by a molecular biologist. Molecular biologists may also formulate and elaborate specific strategies or protocols in governmental agencies using their ability to understand biological processes at the molecular level.

What Can I Do With A Degree In Biochemistry and Molecular Biology (BMB)?
- Anesthesiologist
- Chemist
- Cytologist
- Laboratory Supervisor
- Pharmaceutical Sales Rep.
- Biochemist
- Clinical Research Specialist
- Dairy Technologist
- Patent Attorney
- Pharmacist
- Biomedical Engineer
- College Professor
- Geneticist
- Perfumer
- Physician
- Process Development Specialist
- Regulatory Affairs Specialist
- Product Development Manager
- Science Teacher
- Quality Control Inspector
- Toxicologist

**Important Note:** Bachelor’s and master’s degree holders qualify for some entry-level positions in biochemistry and molecular biology. However, biochemists and molecular biologists generally need a Ph.D. to work in independent research and development. After earning the Ph.D, many scientists in this field seek to fill a temporary postdoctoral research position (2-3 years) at a university.

**Who Could I Work For?**

- Government Agencies including:
  - Centers for Disease Control
  - Department of Agriculture
  - Department of Defense
  - Department of Health and Human Services
- Bio-Tech Companies
- Colleges and Universities
- Environmental Management Firms
- Energy Companies
- Forensic Labs
- Hospital
- Law Firms
- Chemical Engineering Firms
- Non-profit Organizations
- Perfumes and Cosmetic Companies
- Pharmaceutical Companies
- Agriculture
- Food institutes

**Where Might I Do An Internship?**

*UMass Amherst Biochemistry and Molecular Biology Majors Have Done Internships at these sites:*

- Abbott Laboratories
- Alexion Pharmaceuticals
- American Friends Service Committee
- Amgen Inc.
- Amherst (Town of)
- Baystate Medical Center
- Boston Biochem
- Broad Institute
- CFRx
- Children's Hospital Boston
- Coastal America Foundation
- Cubist Pharmaceuticals
- Dana-Farber/Harvard Cancer Center
- Eastman Chemical Company
- EMD Millipore
- GlycoSolutions Corp
- Horace Mann Educated Financial Solutions
- inviCRO, LLC
- MASSPIRG
- Pfizer
- Riken
- Sanofi Group (Pasteur & Genzyme)
- Scripps Research Institute
- Stanford University
- U of Texas SW: Grad School for Biomed Science
- UMass Amherst Emergency Medical Services
- UMass Amherst Environmental Health & Safety
- UMass Amherst Green Office Program
- UMass Amherst Student Legal Services
- UMass Medical School (Worcester)
- US Army: Natick Soldier Center
- UTC Aerospace Systems

**Career Planning Resources & Websites**

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

(Click on "What Can I do with this Major" icon on the right-hand column.)
O-Net: “Biochemists and BioPhysicists”  www.onetonline.org/link/summary/19-1021.00
O-Net: “Molecular and Cellular Biologists”  www.onetonline.org/link/summary/19-1029.02
Massachusetts Career Information System  www.masscis.intocareers.org

(Click Mass Resident to login with “Amherst/01003”  Then click “Occupations” or “Assessments”)
Amer Chem Society “Chemistry Careers“  www.acs.org/content/acs/en/careers
Organic Chemistry Resources Worldwide  www.organicworldwide.net
Mass Life Sciences Center  www.masslifesciences.com
Biotech Now  www.biotech-now.org

BMB Job Search Resources
UMass Handshake Database of Internships & Jobs  https://umass.joinhandshake.com/
Bio-Tech
Biotech Careers  https://www.biotech-careers.org/
Mass Medical Device Industry Council  https://business.massmedic.com/jobs
BioPharmGuy Entry level jobs  https://biopharmguy.com/services/entrylevel.php

Chemistry
Chemistry Jobs  www.chemistryjobs.com

General Biology And Science Jobs
* Life Sciences Recruiters for multiple companies  www.propelcareers.com
Bio Space  www.biospace.com/jobs/homepage/
Biology Jobs  www.BiologyJobs.com
Hire Bio  www.hirebio.com
American Society for Cell Biology  https://jobs.ascb.org/
* More sites for Life Science Jobs  www.masslifesciences.com/resources
Forensic Science Jobs  https://webdata.aafs.org
General Science Jobs (widely defined)  https://jobs.sciencecareers.org/
New Scientist Jobs  https://jobs.newscientist.com/
NatureJobs (widely defined)  www.nature.com/naturejobs/science/
Science Journal  http://sciencecareers.sciencemag.org/
List of Science Job Sites  www.botw.org/top/Science/Employment

Government Agencies
National Institutes of Health  www.jobs.nih.gov/vacancies/scientific/
Health and Human Services Jobs  https://www.hhs.gov/careers/
USDA Agricultural Research Service  www.ars.usda.gov/careers/careers.htm

Internships and Research Opportunities
* Finding Independent Lab Research On Campus  www.umass.edu/biochem/undergraduate/lab
* Office of Undergraduate Research and Studies (OURS)  www.umass.edu/ours
* Mass Life Sciences Internship Program  http://www.masslifesciences.com/programs
* STEM Internships in Federal Government  https://stemundergrads.science.gov/
* Bio-Med Research Opps for Pre-Meds (BIG List)  https://people.rit.edu/gtfsbi/Symp
* Summer Medical Research Programs  www.aamc.org/members/great/61052
* Summer STEM Research Opportunities  www.pathwaystoscience.org/programs
Broad Institute Summer Research Prgrm in Genomics  https://www.broadinstitute.org/bsrp

Pharmaceuticals
International Society of Pharmaceutical Engineers  UMass Amherst ISPE chapter!  https://www.ispeboston.org/
American Assoc of Pharma Scientists Jobs Board  https://careerfair.aaps.org/
GET YOUR $40 AAPS STUDENT MEMBERSHIP!  https://biopharmguy.com/
Current jobs  www.biopharmguy.com
Sample entry level job descriptions, and a list of New England pharma companies.  www.biopharmguy.com
Drug Information Association  www.diaglobal.org/resources/career-center
HireRX  http://www.hirerx.com

General Job Search Engines
One-Stop Career Centers (search by zip code)  www.careeronestop.org/jobsearch/findjobs
GlassDoor  www.glassdoor.com/index.htm
Indeed  www.indeed.com
SimplyHired  www.simplyhired.com

BMB Professional Organizations
American Association for the Advancement of Science  www.aaas.org
American Association of Pharmaceutical Scientists  www.aaps.org
American Chemical Society  www.acs.org
American Physiological Society  www.the-aps.org
American Society for Biochem and Molecular Bio  www.asbmb.org
American Society for Cell Biology  www.ascb.org
American Society for Virology  www.virology.net/jobs/
Association of American Medical Colleges  www.aamc.org
Association of Biomolecular Resource Facilities  www.abrf.org
Biochemistry Society  www.biochemistry.org
Biophysical Society  www.biophysics.org
Biotechnology Industry Organization  www.bio.org
Cell Death Society  www.celldeath-apoptosis.org
Intl Society for Molecular Electronics and Biocomputing  http://mebc.elte.hu/
Massachusetts Biotechnology Council  www.massbio.org
Microscopy Society of America Listserv  www.microscopy.com
Society for Industrial Microbiology  http://www.simbhq.org/
Society for In Vitro Biology  www.sivb.org
UC Santa Barbara Library (Huge Biochem List)  http://guides.library.ucsb.edu/mcdb
World Molecular Imaging Society  http://www.wmis.org/
Important Transferable Qualities To Include On Your Resume

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

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

Interpersonal skills. Biochemists 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. Biochemists 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 biochemists must not become discouraged in their work.

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

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

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

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