

# Why Biomedical Science and Biotechnology?

The thriving biomedical science and biotechnology industries can open rewarding and well-paid careers at the forefront of discovery in science and technology. Graduates can seek a broad range of careers in public, private and government organisations where they will apply their

skills and passion for science to the health and medical industry, as well as in food and pharmaceuticals.

\* *biotechinstitute.org, 2017*

^ *QS World Rankings by Subject 2021, Biological Sciences Majors/specialisations*

1. 90% of biotechnology jobs were created in the past 10 years\*.
2. Use revolutionary gene editing technology at SAGE, the first genome editing facility in Australia.
3. Ranked No 1 in SA for biological sciences^.

## Summary of entry requirements

Degree	CRICOS code	Duration	Prerequisites	Assumed Knowledge
<b>Undergraduate</b>				
Applied Data Analytics (Bioinformatics)	0100937	3	Mathematics (Physics or Specialist Mathematics are prerequisites for some first year courses)	
Science (Biomedical Science)	023455A	3	Chemistry and one other subject chosen from Mathematics, Physics, Geology, Biology, Agriculture & Horticulture or Nutrition	Mathematics and Physics
Science (Biotechnology)	031007C	3	Mathematics and Chemistry	Physics
Science (Biotechnology) (Honours)	103526B	4	Mathematics and Chemistry	
Science	002805B	3	None, however Chemistry, Physics and Mathematics are prerequisites for some majors	Chemistry, Mathematics and Physics
Science (Honours)	0100756	4	None, however Chemistry, Physics and Mathematics are prerequisites for some majors	Chemistry, Mathematics and Physics
Science (Advanced)	072659E	3	None, however Chemistry, Physics and Mathematics are prerequisites for some majors	Chemistry, Mathematics and Physics
Science (Advanced) (Honours)	0100757	4	None, however Chemistry, Physics and Mathematics are prerequisites for some majors	Chemistry, Mathematics and Physics
<b>Postgraduate</b>				
Biotechnology (Biomedical)	072995M	2	Relevant bachelor degree or equivalent in a field such as genetics, biochemistry or molecular biology or another related field.	

Please visit [Degree Finder](#) for country specific academic entry requirements and program specific English language requirements.

## Industry/career outcomes

Biomedicine and biotechnology are hot prospects right now. Health and medical sciences are at the forefront of South Australia's economic growth strategy, with a target to increase contribution in this area from \$2.3billion to \$5billion by 2030.\*

The University of Adelaide is a key player in Adelaide's BioMed City, which is one of the largest health precincts in the southern hemisphere. The precinct draws together opportunities in research, education, clinical care and business development.

Both industries are growing at an amazing pace too. Predicted developments might sound like they are from a science fiction movie, but they are fast becoming science fact; genome editing, 3D printed organs and DNA vaccinations are all on the horizon.

\* *South Australian Health and Medical Industries Sector Plan 2020 to 2030, October 2020*

### Biomedical Science

If I ask you to picture someone who works in health, we often think of frontline workers or allied health professionals, but there's

a hidden side to healthcare that changes people's lives in equally profound ways, and that is biomedical science. These scientists really are our hidden heroes of health. Their work covers areas like vaccine discovery, regenerative medicine and new genetic therapies, just to name a few.

Roles in this industry include: medical scientist, biotechnologist, biomedical scientist, pharmaceutical sales, microbiologist, genetic counsellor, diagnostic laboratory technician, infectious disease specialist and drug researcher or developer.

### Biotechnology

It is in the field of biotechnology where health discovery really gets scaled up. It bridges the gap between science and our community by taking discoveries from the lab to market.

Biotechnology is not just about health though. It provides solutions to climate change, fuel alternatives and food security.

Roles in this industry include: biotechnologist plant breeder, business development manager, clinical researcher, pharmaceutical representative, environmental biotechnologist and entrepreneur. You could work in vaccine discovery, medical diagnostics, develop

## WANT TO KNOW MORE?

Check out our [Careers in Science brochure](#) for more information about what these roles involve or to discover the vast and varied career options available in science.

genetically modified organisms or work to improve plant and animal breeding.

### Applied Data Analytics in Bioinformatics

Bioinformatics is hybrid of science and computational technology to capture and interpret biological data. Data is key to identifying and treating diseases and health problems, but the real skill lays in knowing what to do with the mountains of data we're generating.

Roles in this area include: food security researcher, bioinformatician, biostatistician, data analyst, clinical data manager and biomedical data scientist.

## Majors/specialisations

Major	Degree
<b>Biochemistry</b> <ul style="list-style-type: none"> <li>• Study biochemistry and molecular biology concepts (DNA replication, transcription, metabolism, cell signalling).</li> <li>• Understand the molecular basis of major diseases, as well as the medical applications used to treat them.</li> <li>• Explore drug design, gene editing, stem cell technology and synthetic biology.</li> </ul>	<ul style="list-style-type: none"> <li>• Bachelor of Science (Biomedical Science)</li> <li>• Bachelor of Science</li> <li>• Bachelor of Science (Advanced)</li> <li>• Bachelor of Science (Honours)</li> <li>• Bachelor of Science (Advanced)(Honours)</li> </ul>
<b>Bioinformatics</b> <ul style="list-style-type: none"> <li>• Build a foundation of skills in chemistry, biology and genetics that will help you to create tools to analyse and interpret biological data.</li> <li>• Learn about the underlying theory and skills for design and analysis and interpretation of genome, transcriptome and epigenomic experiments and datasets.</li> <li>• Learn different sequencing technologies and an understanding of the algorithms used to align, assemble, and annotate sequence data.</li> </ul>	<ul style="list-style-type: none"> <li>• Bachelor of Science</li> <li>• Bachelor of Science (Advanced)</li> <li>• Bachelor of Applied Data Analytics (Bioinformatics)</li> <li>• Bachelor of Science (Honours) and Bachelor of Science (Advanced)(Honours)</li> </ul>
<b>Genetics</b> <ul style="list-style-type: none"> <li>• Build a broad knowledge base by covering areas like how genes function, genetic linkage, gene expression and the power of genetic analysis.</li> <li>• Learn directly from world-class researchers.</li> <li>• Learn current skills in managing genome sequences and other large data sets.</li> </ul>	<ul style="list-style-type: none"> <li>• Bachelor of Science (Biomedical Science)</li> <li>• Bachelor of Science</li> <li>• Bachelor of Science (Advanced)</li> <li>• Bachelor of Science (Honours)</li> <li>• Bachelor of Science (Advanced)(Honours)</li> </ul>
<b>Microbiology and Immunology</b> <ul style="list-style-type: none"> <li>• Gain insights into the molecular mechanisms by which micro-organisms interact with host cells to cause disease.</li> <li>• Learn how mammalian immune system works and how it can control diseases.</li> <li>• Cover vaccines, drug design, and therapeutic interventions for infection.</li> <li>• Use cutting edge technologies; advanced microscopy and gene editing.</li> </ul>	<ul style="list-style-type: none"> <li>• Bachelor of Science (Biomedical Science)</li> <li>• Bachelor of Science</li> <li>• Bachelor of Science (Advanced)</li> <li>• Bachelor of Science (Honours)</li> <li>• Bachelor of Science (Advanced)(Honours)</li> </ul>
<b>Molecular Biotechnology</b> <ul style="list-style-type: none"> <li>• Study topics like genetic circuits and synthetic biology, plus what happens when we artificially manipulate genes.</li> <li>• Investigate the development of new therapies and molecular interactions.</li> <li>• Explore aspects of technology, business and ethical issues relevant to the diverse nature of biotechnology industry.</li> </ul>	<ul style="list-style-type: none"> <li>• Bachelor of Science (Biotechnology)</li> <li>• Bachelor of Science (Biotechnology) (Honours)</li> </ul>

## Learning outcomes

### Bachelor of Science (Biomedical Science)

Our Bachelor of Science (Biomedical Science) gives you the knowledge and skills to explore human disease, from its cause and diagnosis through to novel treatments and cures. You will:

- study how the body works and what happens when it fails
- specialise in either biochemistry, genetics, or microbiology and immunology
- explore how to stop deadly outbreaks of disease and create life-saving vaccinations
- build a vast knowledge base from simple molecules to whole organisms
- learn from world-class biomedical researchers who are currently investigating potential cures for major diseases such as cancer, malaria and influenza
- develop laboratory skills, with opportunities for practical placement in a research lab.

#### Sample subjects

- Chemistry
- Biology: Human Perspectives
- Gene Expression and Human Developmental Genetics
- Infection and Immunity

## WORLD-CLASS RESEARCH PAIRED WITH INDUSTRY LINKS

Our degrees in biomedical sciences and biotechnology are taught by some of the brightest minds in the field, blending their world-class expertise and discoveries with their teaching. Our collaboration with biomedical researchers at SAMHRI gives us access to cutting-edge technologies such as CRISPR gene editing technology, and we work closely with industry, either through guest lectures, internships or summer research placements.

### Bachelor of Science (Biotechnology)

Our Bachelor of Science (Biotechnology) sits at the intersection of innovation and scientific knowledge. It combines traditional science with aspects of engineering and computer science. You will:

- focus on molecular biotechnology, which is the manipulation of microorganisms, such as yeast and bacteria
- learn how to take your discoveries from the lab to the market and broader community
- delve into areas like drug development, gene therapy or the identification of biomarkers for cancer
- how to produce food, drugs and other products
- study alongside research-active experts.

#### Sample subjects

- Biology
- Microbiology
- Biotechnology Practice
- Chemistry

### Bachelor of Science (Biotechnology) + Honours

Our direct-entry Bachelor of Science (Biotechnology) (Honours) provides high achieving students with automatic entry into an honours year, provided a 4.5 grade point average (GPA) is maintained.

In addition to a Molecular Biotechnology major, you'll be able to choose a second specialisation in: Bioinformatics; Chemistry; Genetics; or Microbiology and Biomedical Science. You can also gain valuable work experience through an industry internship. And your research skills will be honed through a major research project and/or industry-related project in your honours year.

### Bachelor of Applied Data Analytics (Bioinformatics)

Our Bachelor of Applied Data Analytics (Bioinformatics) is the only data analytics degree in South Australia. It is a great choice if you like the process of making decisions and solving problems. You will:

- combine big-data analytics training with decision science
- develop skills in statistical inference, including using machine learning
- focus on discipline knowledge with additional training in handling big data
- undertake a research project in your final year; along with internship opportunities and an industry based project.

#### Sample subjects

- Statistics
- Data Handling and Visualisation
- Bioinformatics

### Master of Biotechnology (Biomedical)

Our Master of Biotechnology (Biomedical) focuses on innovative technologies for disease prediction and treatment. You will:

- learn from active researchers in biomedical science
- gain the latest industry insights from lab placements
- take courses in entrepreneurship, innovation, and intellectual property management
- undertake a one-year independent research project.

You'll also gain access to the following internationally renowned research facilities and centres:

- Adelaide Proteomics Centre (APC)
- Adelaide Microarray Centre (SAHMRI)
- SA Genome Editing Facility (SAGE)
- Genomics Facility (SAHMRI)
- Confocal Microscopy
- Adelaide Microscopy
- Bioinformatics Hub.

## What's the difference between Biomedical Science and Biotechnology?

	<p><b>Biotechnology</b></p> <p>Biotechnology will suit you if you're interested in the use of living organisms, or the products of living organisms for the production of food, drink, medicine or for other benefits to humans or animals. It combines traditional science with aspects of engineering and computer science and focuses on molecular biotechnology.</p>	<p><b>Biomedical Science</b></p> <p>Biomedical sciences is a great choice if you are interested in the human body, how it works and what happens when it doesn't. It focuses on areas like diseases, their causes, treatments and cures through specialisations in biochemistry, genetics and microbiology and immunology. It has more of a traditional clinical lab focus.</p>
<b>Applications</b>	<p>Applications of Biotechnology are varied across many industries. These include health and medicine, agriculture, food processing and preservation, bio-fuels and bio-energy, chemical industry, environmental management, waste management, mining, forestry, aquaculture, soil conservation, etc. Biotechnology mainly deals with natural sciences.</p>	<p>Human biology, physiology, anatomy, pathology, molecular and cell biology, biochemistry, microbiology, pharmacology, bio-statistics, infectious diseases, immunology, neuroscience, analytical chemistry, bioinformatics and genetics.</p>
<b>University of Adelaide degree areas of specialisations</b>	<ul style="list-style-type: none"> <li>• Molecular Biotechnology</li> </ul>	<ul style="list-style-type: none"> <li>• Biochemistry</li> <li>• Genetics</li> <li>• Microbiology and Immunology</li> </ul>

## Related degrees

For a list of all of our science related degrees visit:

[adelaide.edu.au/degree-finder/biomed](http://adelaide.edu.au/degree-finder/biomed)

- Bachelor of Science
- Bachelor of Science (Advanced)
- Bachelor of Teaching (Middle) and Bachelor of Science
- Bachelor of Teaching (Secondary) and Bachelor of Science
- Bachelor of Health and Medical Sciences
- Bachelor of Health and Medical Sciences (Advanced)

### FOR MORE INFORMATION

For more details about specific degree requirements and study plans, visit: [adelaide.edu.au/degree-finder](http://adelaide.edu.au/degree-finder)