

# BIOCHEMISTRY

## What is a biochemist?

*Biochemistry is the study of the chemistry of living organisms, from the simplest to the most complex, and it seeks to explain how they work at the molecular level. Biochemists study the elements, compounds and chemical reactions that are controlled by enzymes and take place in these organisms.*

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## What do they do?

Biochemistry is often defined as the 'chemistry of life' because it aims to explore and understand every aspect of the structure and function of all living things at the molecular level. Biochemistry is very much a research-based subject and biochemists use a broad range of sophisticated experimental techniques that allow them to study the functions of individual molecules, such as genes and proteins, within cells and organisms. Such research is essential to medicine. The involvement of the biochemist in the development of new diagnostic procedures and drugs for the treatment of diseases is of central importance to the pharmaceutical industry.

Biochemistry is also fundamental to biotechnology and agriculture where processes for the production of foodstuffs and the prevention or eradication of environmental pollution are developed. Biochemistry is the key player in modern biomedical research as biochemists contribute to the design of new drugs and help us to understand the nature of diseases, such as diabetes and cancer. Developments in this rapidly-growing area of science have led to exciting advances in fields such as molecular biology, genetic engineering and environmental monitoring. This is an exciting and rapidly expanding field which is at the forefront of advances in biology and medicine.

## As a biochemist you could...



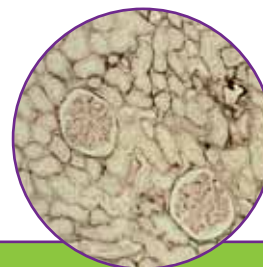
*use engineered therapeutic proteins in medicine*



*engineer plants which are drought or pesticide resistant*



*work in computer-aided protein modelling and drug design*



*study the use of microorganisms to produce alcohol or antibiotics*

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## Career opportunities

The massive increase in knowledge and the genomics, proteomics and computing revolutions, mean that biochemistry will be a decisive factor in the 21st century. The fundamental new findings in this area of science will have a far-reaching impact on health care, the control of environmental hazards and on life as a whole and offers much potential for the creation and preservation of new, challenging jobs.

Biochemists work in industry, hospitals, agriculture, research

institutes and education. There are good career opportunities in industry sectors such as pharmaceuticals, food, brewing, biotechnology and agrochemicals, where biochemical knowledge is needed to develop new products and monitor the production, quality and safety of existing ones.

Biochemistry is a truly interdisciplinary subject having close links with chemistry, the other biological sciences, agriculture and medicine. It is because of this that graduates in biochemistry enjoy a wide range of career opportunities.

## Did you know?



### Revolutionary treatments

Advances in medicine have resulted in treatments unimaginable just 50 years ago. The pace of change in science and medicine in the next 20 years means that medical intervention will seem increasingly futuristic. We still do not know the structures and biological roles of over 70% of the compounds found in human blood plasma! Scientists speculate that recent developments in genetic science may revolutionise the way we diagnose and treat illnesses.



### Fighting bad bugs

Most infections still respond to the so called 'first line' antibiotics such as ampicillin. Of those that don't, most are still killed with more powerful antibiotics; the strongest and most potent is called vancomycin. Frighteningly, though, some bacteria have evolved to outwit even vancomycin and have been found in a number of hospitals. Scientists are now researching new antibiotics, but this takes time. Eventually, as stronger ones are developed, bacteria will develop resistance to those.



### Deep breathing

Marine mammals like seals and whales also breathe oxygen like us. However, their red blood cells don't have hemoglobin, but a very similar protein called myoglobin. Actually hemoglobin is essentially four myoglobin proteins stuck together. Myoglobin also binds oxygen, but much more strongly than hemoglobin. Why is this important? Well, sea mammals dive to great depths, and they need to make sure that when they come up for air that they have a protein that really grabs onto oxygen. They have a lot of this protein and a lot of red blood cells that slowly release it to their tissues allowing them to stay underwater for a long time!