What is it that makes chemical compounds come together to form living organisms? The answer to this question is found within the discipline of biochemistry, which sits at the boundary between the physical and the life sciences.

As well as dealing with the fundamental physical nature of life itself, biochemistry has a vital part to play in dealing with many current critical issues such as human health and disease, the growth of biotechnology, and feeding the world’s growing population. Technological advances in DNA sequencing have provided unprecedented amounts of data about biological systems in the form of the complete genome sequences of humans and many other organisms. It is through biochemistry that we can translate these data into a better understanding of how living systems work, and therefore design better drugs to deal with disease and optimise biotechnological processes. This is a particularly exciting time to study biochemistry. The demand for biochemists continues to rise and job prospects in the field are excellent.
BIOCHEMISTRY AT YORK

The Biochemistry degree programmes at York are the result of a long-standing and fruitful collaboration between the Departments of Biology and Chemistry. Both of these departments have excellent facilities for teaching and research and are ranked consistently amongst the top Biology and Chemistry Departments for student satisfaction in the National Student Survey.

About half of the academic staff in each department are engaged in some aspect of biochemistry research. This research impacts on many aspects of our teaching of biochemistry and as an undergraduate you will have an opportunity to experience working in a state-of-the-art biochemical laboratory during your final year research project.

Like many students I wasn’t 100% sure about the career I wanted to go into, but having learned in detail about the complexity of the skin, I became interested in pursuing a career related to dermatology. My next step will be to study for a postgraduate medicine degree.

Susana, Final Year Student
We offer both BSc Honours and MBiochem degrees in Biochemistry. Both of these can be taken with either an extra year in industry or Europe.

The MBiochem adds an extra year to the BSc programmes and specifically focuses on the skills needed for a career as a research scientist. During this time you carry out further work with research scientists within two of the UK’s top science departments to learn specialised research techniques and gain experience in a cutting edge research lab.
If you are having difficulty deciding between Chemistry and Biology, why not do both? The Biochemistry course provides students with a seamless integration of the two subjects providing a perspective that you would miss out on by doing just one of the subjects.

Nicholas, Second Year Student
Degree Programmes with a Year in Industry

If you are successful in the competitive selection process, an extra year, following Stage 2, is spent gaining research experience in an industrial or research institute laboratory. An Industry Liaison Officer guides you through the process of applying for a placement, and you receive support from the Department during your year away.

We have excellent relationships with a wide variety of organisations and we place students with employers to match their interests, ranging from pharmaceutical companies (such as AstraZeneca, GlaxoSmithKline, Novartis) to medical research institutes (The Genome Analysis Centre, Institute of Animal Health, Rothamsted Research, MRC Harwell).

Taking a year out in industry has many benefits, including gaining hands-on experience of working in a research environment, acquiring more transferable skills, such as teamwork and time management – invaluable for your final year, and highly prized by prospective employers and PhD supervisors.
Degree Programmes with a Year in Europe

We also offer the opportunity to spend an extra year of your degree in a European partner country. The "Year in Europe" programme is overseen by academic co-ordinators with relevant expertise and experience, and may be eligible for financial support. As well as continuing to develop your scientific knowledge and skills, you would have the opportunity to experience a different culture, improve your language and communication skills and increase your self-confidence - all advantageous when you apply for jobs, as employers greatly value international experience.

There are two departmental schemes to choose from:

Study or laboratory placements. Our study placements offer you the opportunity to spend your year away studying at one of our partner universities, currently in France, Germany, Spain and Denmark. During your year abroad, you take a range of courses and carry out a project to complement your studies at York. Language prerequisites may apply for this study route and the requirements for each of our partners can be found online at york.ac.uk/erasmuspartners. Language tuition is available through Languages for All (LFA) in your first two years at York. In addition to LFA, the Centre for Global Programmes offers language and intercultural courses called Languages for International Mobility (LFIM) which can help you prepare for your year abroad. Further language courses may also be provided by the host University during your studies abroad.

Laboratory placements. As an alternative to a study placement, you can elect for a full-time laboratory placement during your third year, working on a research project that will complement your studies at York in an internationally renowned European laboratory, either in a university or a research organisation. Since English is the accepted working language in these laboratories, familiarity with the language of the host country is not a prerequisite, although some working knowledge will be useful for everyday life. Studying outside of Europe.

Worldwide exchange programme

The Centre for Global Programmes offers a structured credit-replacing worldwide exchange programme where you can apply to study for an academic year at a partner university overseas. The University of York has links with top institutions in North and Latin America, Asia and Australia. Studying abroad through the worldwide exchange programme gives you the opportunity to experience different academic and social cultures without extending the length of your degree. Worldwide exchanges are open to undergraduates across other University departments and are determined through an internal application process. You would make an application during your first year at York, and if successful you would spend Stage 2 at your host university.

At York we aim to provide every student with an opportunity to gain an international experience, either on campus or by travelling abroad. This can range from a study placement for a full academic year to a two-week academic and cultural programme at one of our partners universities abroad.

For further information go to york.ac.uk/globalyork

Doing the year in industry programme was one of the best decisions I have ever made, not only for my scientific development, but also for my personal development. Seeing science in the real world, and putting theory into practise has given me valuable skills that will help me in my future career.

Hollie, Masters in Biochemistry with a Year in Industry
Stage 1 Modules

At Stage 1, the modules described below are compulsory for all students. They run concurrently and provide a foundation in all the main strands of the subject. Students take an additional module each term, which includes regular tutorials, and develop more general scientific and transferable skills.

**Foundation Chemistry for Biochemists 1 & 2**

Covers essential aspects of organic, inorganic and physical chemistry relevant to the understanding of biomolecules.

**Genetics**

Considers how DNA is organised into chromosomes and genomes in a variety of organisms, from bacteriophage to humans, and examines gene expression through the processes of transcription and translation. Gene mutations and chromosome aberrations are considered in the context of human genetics and disease, and in terms of their significance in evolution.

**Molecular Biology and Biochemistry**

Explores the relationship between structure and function at the molecular and cellular levels. It examines how chemical reactions provide energy and building blocks, and how enzymes provide catalysis and control.
Microbiology
Examines the cell biology of microorganisms. It introduces the diverse world of microorganisms, including bacteria, viruses, algae, fungi and protozoa, with particular reference to the relationships between structure and function.

Cell and Developmental Biology
Introduces the cell biology of eukaryotic organisms, their evolution and diversity. The module looks at the behaviour of cells within the context of multi-cellular organisms. The roles of the extracellular environment, cell signalling and differential gene expression in the regulation cell fate, differentiation and the patterning of structures within animals and plants.

Biochemical Skills 1
Provides a grounding in the design, execution and presentation of biochemical experiments as well as dealing with fundamental aspects of the experimental techniques used in biochemistry.
Stage 2 Modules

In Stage 2 you can select modules from the list below. A number of core modules in each term will be compulsory.

<table>
<thead>
<tr>
<th>Modules</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Biophysical Chemistry</td>
<td>10c</td>
</tr>
<tr>
<td>Cell Biology</td>
<td>20c</td>
</tr>
<tr>
<td>Chemical Logic for Biochemists (CHEM)</td>
<td>10c</td>
</tr>
<tr>
<td>Food &amp; Fuel</td>
<td>20c</td>
</tr>
<tr>
<td>Immunology &amp; Infection</td>
<td>20c</td>
</tr>
<tr>
<td>Laboratory &amp; Professional Skills for Bioscientists</td>
<td>20c</td>
</tr>
<tr>
<td>Molecular Biology, Biotech &amp; Bioinformatics</td>
<td>20c</td>
</tr>
<tr>
<td>Molecular Genetics &amp; Development</td>
<td>20c</td>
</tr>
<tr>
<td>Neuroscience</td>
<td>20c</td>
</tr>
<tr>
<td>Pharmacology (BMS)</td>
<td>10c</td>
</tr>
<tr>
<td>Protein Structure &amp; Function (CHEM)</td>
<td>10c</td>
</tr>
<tr>
<td>Strategy to Synthesis (CHEM)</td>
<td>10c</td>
</tr>
<tr>
<td>Tutorials</td>
<td>10c</td>
</tr>
</tbody>
</table>

In addition, a laboratory & professional skills module runs throughout Stage 2. This includes laboratory based group projects and other sessions aimed at developing experimental design, research skills and graduate level skills in project management and communication. There is a focus on modern techniques appropriate to your interest, applying experimental approaches to biological problems, and learning quantitative and computational approaches to analyse data. You also continue to take small group tutorials.

Stage 3 Modules

The BSc and MBiochem programmes diverge at Stage 3. BSc students take four modules and an individual research project; Masters students take five modules and a group research project.

<table>
<thead>
<tr>
<th>Modules</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Project (BSc Core Module)</td>
<td>40c</td>
</tr>
<tr>
<td>Group Research Project (MBiochem Core Module)</td>
<td>20c</td>
</tr>
<tr>
<td>Advanced Topics in Biotechnology</td>
<td>20c</td>
</tr>
<tr>
<td>Advanced Topics in Cell Biology</td>
<td>20c</td>
</tr>
<tr>
<td>Advanced Topics in Neuroscience</td>
<td>20c</td>
</tr>
<tr>
<td>Advanced Topics in Molecular Biology</td>
<td>20c</td>
</tr>
<tr>
<td>Advanced Topics in Microbiology</td>
<td>20c</td>
</tr>
<tr>
<td>Biological Macromolecules as Machines</td>
<td>20c</td>
</tr>
<tr>
<td>Cancer Cell and Molecular Biology</td>
<td>20c</td>
</tr>
<tr>
<td>Chemistry and Disease (CHEM)</td>
<td>20c</td>
</tr>
<tr>
<td>Genes and Development</td>
<td>20c</td>
</tr>
<tr>
<td>Immunology and Infectious Disease</td>
<td>20c</td>
</tr>
<tr>
<td>Molecular Recognition</td>
<td>20c</td>
</tr>
</tbody>
</table>

Key:
- ** Taken by all students on the programme
- ** BSc students select 2 modules. MBiochem students select 3
- ** Students choose from these modules to develop their own unique programme
- Each student must take 120c per year
Stage 4 Modules - Integrated Masters

Students taking the MBiochem conduct a substantial (four days per week) research project and two extended research skills modules.

<table>
<thead>
<tr>
<th>Modules</th>
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<tbody>
<tr>
<td>Stage 4 Research Project</td>
</tr>
<tr>
<td>Critical Analysis</td>
</tr>
<tr>
<td>Data Analysis</td>
</tr>
</tbody>
</table>

Key  | Taken by all students on the programme

All modules listed in this brochure are indicative and subject to change, as we regularly update and refine them to keep our teaching as up-to-date as possible.
A Masters degree is a great option if you want a career boost or are thinking of continuing on to do a PhD. It gives you more research experience leading to a greater level of confidence within a working lab and a higher qualification. I would definitely recommend!

Vicki, Biochemistry Alumna
Tutorials
These are one of the most popular and distinctive aspects of our programmes. They are an opportunity for a group of usually just five students to hold informal scientific discussions on a weekly basis with a member of staff. Tutorials help you to develop skills in conceptual thinking and analysis, as well as oral and written communication. You regularly give presentations and there is plenty of opportunity to debate topical issues. You select a different tutor each term in the first and second years.

Lectures
Much of the taught material is delivered through lectures. We aim to deliver lectures that are not just lists of facts, but which offer a stimulating and challenging perspective on a subject and encourage you to study further.

Practicals
Practicals are designed to complement your lectures and other studies. They help you to develop laboratory skills and to become familiar with a wide range of practical techniques, training you to use methods precisely and encouraging you to assess objectively the reliability of your results. These laboratory skills, together with skills in planning experiments and solving problems, will culminate in your research project in the final year of the programme.
Seminars and Workshops
The incorporation of student-led seminars and workshops provides an additional dimension to some modules. Students give presentations, often in small groups, based on recent research papers or on the wider implications of new technologies, from the use of human embryos in stem cell therapies and ‘designer’ babies, through DNA fingerprinting, to contemporary issues such as the use of GM crops and transgenic animals.

Skills and Group Work
Each term during the first two years, students take modules designed to develop more generic scientific and transferable skills. Some modules focus on specific scientific techniques, while others develop skills in problem solving, experimental design and data analysis. We encourage you to develop important communication skills, including working in groups to plan and carry out experiments that investigate a scientific problem, and presenting your work as an oral presentation or poster. The confidence and wide-ranging skills of our students are often commented on by employers.

Research Projects
Research projects are an essential part of your degree and you will spend a considerable amount of time working on this. For many students this is the aspect of the course that they find particularly rewarding. It is your chance to experience research at first hand. You have the support and advice of an academic member of staff, but you work independently and plan and carry out your own experiments. Given the wide-ranging interests of staff in the Departments of Biology and Chemistry, you could be making pharmaceutical molecules in the synthesis lab, or studying the molecular aspects of disease caused by bacteria or viruses. BSc students take a two days per week research project in their final year and MBiochem students undertake an extensive four days per week project in a specific research lab.

My year in Europe really helped me to develop scientifically and personally. Living abroad and working in a world-leading institute means that I am now much more confident in myself and my abilities. I now have a huge advantage for my final year and PhD or job applications.

Claire, Biochemistry with a Year in Industry
Assessment

Modules are examined using a mixture of continuous assessment and closed examination, which helps you to judge how well you are progressing. Although you must perform to a satisfactory level, Stage 1 assessments do not count towards the final degree, which for BSc students is determined by work in Stage 2 (40%) and Stage 3 (60%). For MBiochem students the split is 25% in Stage 2 and 37.5% in Stages 3 and 4.

Year 1 Timetable

In a typical week in the first year, you will have around 25 contact hours, typically six or seven lectures, two or three practicals, a skills workshop and a tutorial. You will spend time on independent study, consolidating information from lectures and practicals, and preparing work for tutorials.
International students form an important part of the community at York, and the Department welcomes students from all over the world.

We offer you an International Student Co-ordinator within the Department, and a personal supervisor to oversee your academic progress and welfare.

We offer one scholarship to a Biochemistry overseas student. If you are paying overseas fees then you are eligible to apply. Application forms are available to download from You@York (applicant’s portal).

"I was attracted to Biochemistry at York because of the amount of support the undergraduates receive and the variety of different modules we are exposed to. These give you an idea as to what you want to do after your degree."

Matthew, Second Year Student
The Biology Department has an in-house employability team who provide one-to-one sessions with students covering careers advice, preparation of job applications and mock (scientific) interviews. The team also run regular careers events, including a two day employability fair each summer, inviting departmental alumni and employers into the Department. The Department has a proactive approach to employability, embedding it into teaching throughout the degree programmes.

Our graduates go on to a wide variety of careers both within and outside of Biochemistry. Examples of roles that our recent graduates are currently undertaking include:

- Molecular Biologist, Fera Science Ltd
- Ecotoxicologist, Shell
- Advanced Research Assistant, Wellcome Trust Sanger Institute
- Research Executive, Blueprint Partnership
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The information in this brochure was correct at the time of going to press (June 2018).