

## PROGRAMME SPECIFICATION

This document describes the **Honours Degree programme in Biochemistry**. This specification is valid for new entrants from **September 2012**.

The aims of the Honours Degree programme in Biochemistry are to:

- provide a sound knowledge and understanding of molecular, cellular, physiological and chemical principles of the subject through a core set of courses, and develop an insight into the current frontiers of knowledge, primarily through a series of specialised level 3 courses;
- develop, through a flexible and progressive structure, a range of subject-specific and transferable skills, including practical laboratory skills, self-management, information retrieval, communication and presentation skills, working with others, decision making and meeting deadlines, that equip students for future employment;
- provide experience of independent research through a final year project;
- produce graduates who can work safely and responsibly with biological and chemical materials and laboratory equipment.

The programme is delivered in three stages, each of which comprises one year of full-time study during which the student must follow courses to the value of four units (one unit is equivalent to 30 national credits). The curriculum is based around a core of mandatory units and the programme offers a strong foundation in Stages one and two, which cover the requirements of the benchmarking statements in molecular aspects of biology (including biochemistry).

**Stage one** provides a fixed selection of core courses and seeks to provide the necessary grounding for the study of the subject at degree level, with appropriate Chemistry and Biological subjects in addition to an introduction to Biochemistry and Molecular Biology. It also includes a strong element of laboratory training. In **Stage two** students take 2 core course units in advanced Biochemistry and Molecular Biology building on the foundations laid in the first year and providing a basis for the study of the research led specialist options in Stage three. Again the courses all include a substantial element of laboratory training that prepares the student for the selection and implementation of the individual research project in Stage three. There are 2 optional units, allowing the students to concentrate on biochemistry or to diversify into other areas depending on their interests. **Stage three** allows for increasing specialisation, with the major focus being on areas of the subject relevant to Biochemistry. In addition to the individual research project and 1 other core half-unit, students select the remaining 5 courses from a list of options, thus allowing students to select from courses that reflect the research interests of internal and external staff, who are specialists in their field.

The programme provides a comprehensive treatment of modern animal, plant and microbial biochemistry, molecular biology and chemistry pertinent to the Biosciences. The programme involves training in a variety of practical techniques and skills relevant to research in biochemistry. The system is also flexible and allows the students to transfer to other degree streams within the Molecular Biosciences, particularly up to the start of the second year.

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This document provides a summary of the main features of the programme(s), and of the outcomes which a student might reasonably be expected to achieve if full advantage is taken of the learning opportunities provided. Further information is

contained in the College prospectus, the College Regulations and in various handbooks issued to students upon arrival. Whilst Royal Holloway keeps all its information for prospective applicants and students under review, programmes and the availability of individual courses are necessarily subject to change at any time, and prospective applicants are therefore advised to seek confirmation of any factors which might affect their decision to follow a specific programme. In turn, Royal Holloway will inform applicants and students as soon as is practicable of any substantial changes which might affect their studies.

## Learning outcomes

Teaching and learning in the programme are closely informed by current developments (including practical aspects) in the subject and by the active research of staff, particularly in the areas of neuroscience, cell and molecular biology, cell signalling, microbial genetics, cancer, parasitology, plant biotechnology, immunology, and gene therapy. In general terms the programme provides opportunities for students to develop and demonstrate these learning outcomes:

### *Knowledge and understanding*

- an understanding of the chemistry that underlies biochemical reactions and techniques used to investigate them;
- an understanding of the chemical and thermodynamic principles underlying biological catalysis and the role of enzymes and other proteins in determining function and fate of cells and organisms;
- a critical understanding of the molecular basis of genetics and the ability to explain how molecular biology underlies much of the basis of modern biosciences;
- an understanding of the structure and function of various sub-cellular structures and cell types in unicellular and multi-cellular organisms, including cell differentiation;
- a knowledge of key topics in cell metabolism, including its control, and topics such as energy and signal transduction, respiration and photosynthesis, with appropriate experimental techniques;
- understanding the molecular, cellular, physiological and chemical principles that underlie the subject;
- understanding cutting edge developments in a range of areas specific to the subject;
- knowledge and engagement with philosophical and ethical issues arising from some of the current developments in the biosciences;
- well-developed strategies for updating, maintaining and enhancing their knowledge of the Biosciences.

### *Skills and other attributes*

- a range of laboratory techniques of key importance in Biochemistry;
- working safely in a scientific laboratory, with awareness of standard safety protocols;
- the ability to apply relevant numerical skills, including statistics, to biochemical data;
- the ability to employ and evaluate suitable experimental methods for the investigation of relevant areas of biochemistry and molecular biology;
- the ability to access information from a wide range of sources in order to maintain and enhance knowledge of the Biosciences and to communicate the principles clearly in oral and written forms;
- assessing the merits of contrasting subject-specific theories, paradigms, concepts and principles;
- applying subject-specific knowledge and understanding to address familiar and unfamiliar problems;
- the ability to plan, design, execute and present an independent piece of research through a theoretical or practical project in biochemistry, including the production of the final report;
- taking personal responsibility for learning, and developing habits of reflection on that learning;\*
- identifying, retrieving (including the use of online computer searches), sorting and exchanging information;\*
- abstracting and synthesising information, and developing a reasoned argument;\*
- critically interpreting and evaluating experimental data and relevant literature, analysing and solving problems, and decision-making;\*
- written communication and verbal presentation;\*
- information technology (including spreadsheets, databases, word processing, email and WWW);\*
- interpersonal skills, including working in groups/teams and recognising and respecting the viewpoints of others;\*
- CV and career preparation.\*

\* transferable skills

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## Teaching, learning and assessment

The overall strategy is to provide a progressive approach to biochemical concepts and systems of increasing complexity through teaching methods that aid learning and stimulate interest. Teaching is mostly by means of lectures, laboratory classes, seminars, tutorials and study/revision sessions, with knowledge and understanding further developed by guided independent study. Learning and analytical ability are developed and reinforced through problem solving, essay writing, laboratory classes, critical evaluation and by giving students the opportunity to design, execute and evaluate their own experiments. Students are encouraged to acquire further knowledge beyond taught material, e.g. by reading topical reviews, original research literature and attending research seminars, especially in the final year. The practical assignments associated with first year and second year courses provide training in a range of subject specific laboratory techniques, including safety assessment. The culmination of these skills is demonstrated in the final year research project, and for literature skills the preparation of a literature report. Students have to prepare their own risk assessment prior to commencing their final year project work.

Training in intellectual and key transferable skills is embodied throughout the programme and forms a strong element of the tutorial and study session programmes. All students are required to meet basic standards in information technology, for which training is provided by the College Computer Centre. Assessment is typically by formal unseen written examinations at the end of each year and coursework such as essays, laboratory reports, poster preparation, oral presentations and Dissertations on core courses. Full details of the assessments for individual courses can be obtained from the [School](#).

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## Details of the programme structure(s)

Please note that the list of available courses offered is subject to change and not all courses run each year. A full list of courses for the current academic year can be obtained from the [School](#).

### Stage one:

Students must take:

- BS1030 Principles of Molecular Bioscience (1 unit)
- BS1060 Living Systems: Cell Biology and Physiology (1 unit)
- BS1070 Genetics and Microbiology (1 unit)
- BS1090 Biochemistry: the Molecular Basis of Life (1 unit)

Part time students must take:

### Stage one (a):

- BS1030 Principles of Molecular Bioscience (1 unit)
- BS1090 Biochemistry: the Molecular Basis of Life (1 unit)

### Stage one (b):

- BS1060 Living Systems: Cell Biology and Physiology (1 unit)
- BS1070 Genetics and Microbiology (1 unit)

### Stage two:

Students must take:

- BS2510 Bioenergetics, Biosynthesis and Metabolic Regulation (½ unit)
- BS2520 Protein Structure and Function (½ unit)
- BS2530 Molecular Biology (½ unit)
- BS2570 Physical Biochemistry for Life Scientists (½ unit)

and choose 4 options from the following Stage two courses:

- BS2040 Cell Biology (½ unit)
- BS2060 Developmental Biology (½ unit)
- BS2150 Applications of Molecular Genetics in Biology (½ unit)
- BS2540 Molecular and Cellular Immunology (½ unit)
- BS2550 Hormones and Neuronal Signalling (½ unit)
- BS2560 Pharmacology and Toxicology (½ unit)

Part time students must take:

### Stage two (a):

BS2510 Bioenergetics, Biosynthesis and Metabolic Regulation ( ½ unit)

BS2520 Protein Structure and Function (½ unit)

BS2570 Physical Biochemistry for Life Scientists (½ unit)

and choose options equal to the value of one half unit from the stage two courses listed above.

**Stage two (b):**

BS2530 Molecular Biology (½ unit)

and choose options equal to the value of one and a half units from the Stage two courses listed above.

**Stage three:**

Students must take:

BS3010 Individual Research Project (1 unit)

BS3560 Proteomics, Genomics and Bioinformatics (½ unit)

and choose 5 options from the following Stage three courses:

BS3020 Special Study: Dissertation (½ unit)

BS3030 Biology of Parasitic Diseases (½ unit)

BS3190 Climate Change: Plants and the Environment (½ unit)

BS3510 Molecular and Medical Microbiology (½ unit)

BS3530 Advanced Molecular Biology (½ unit)

BS3540 Cell and Molecular Biology of Cancer (½ unit)

BS3570 Human Embryology and Endocrinology (½ unit)

BS3580 Cell and Molecular Neuroscience (½ unit)

BS3590 Molecular Basis of Inherited Disease (½ unit)

Part time students must take:

**Stage three (a):**

BS3010 Individual Research Project (1 unit)

BS3560 Proteomics, Genomics and Bioinformatics (½ unit)

and choose options equal to the value of a half unit from the Stage three courses listed above.

**Stage three (b):**

Choose options equal to the value of two units from the Stage three courses listed above.

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**Progression and award requirements**

The progression and award requirements are essentially the same across all Honours Degree programmes at Royal Holloway. Students must pass courses to the value of at least three units on each stage of the programme. On some programmes there may be a requirement to pass specific courses in order to progress to the next stage, or to qualify for a particular degree title (see programme structure above). Students are considered for the award and classified on the basis of a weighted average. This is calculated from marks gained in courses taken in stages two and three, and gives twice the weighting to marks gained in stage three. In order to qualify for the award of Biochemistry degree, students must gain a weighted average of at least 35%, pass at least 3 Units in the final year and take the core courses specified above.

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**Student support and guidance**

- Personal Advisers: All students are allocated a Personal Adviser who meets with them regularly through the programme. The Personal Adviser's role is to advise on academic, pastoral and welfare issues, but with referral of students for professional help, e.g. counselling, if required. Students work closely with their Personal Advisers in tutorial groups of around 7, primarily throughout the teaching terms.
- The Director of Teaching and Academic Coordinators provide a back-up system of academic, pastoral and welfare advice.
- Provision of study skills sessions throughout the academic year focuses on enhancing generic study skills. The aim is to facilitate the transition of students to the University learning environment allowing them to perform to the best of their academic ability. Excellent associated online resources are also available through Moodle, the virtual learning environment, and on the Royal Holloway website.

- All staff are available and accessible through an open-door policy or by operating a defined office hours system, or by appointment.
- Representation on the Student-Staff Committee.
- Staff-undergraduate ratio of 1:15 (2009/10).
- Detailed student handbook and course resources.
- Extensive supporting materials and learning resources in College libraries, the Computer Centre and via the School website and Moodle.
- Dedicated School teaching laboratories are housed in the School of Biological Sciences (Bourne) Building.
- The School of Biological Sciences has two Education Support Office network members.
- College Careers Service and School Careers Liaison Officer, supplemented by a dedicated careers area.
- Access to all College and University support services, including Student Counselling Service, Health Centre and the Education Support Office for students with special needs.

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### **Admission requirements**

The programme's standard conditional offer is normally at least 320 UCAS tariff points, with a standard A-Level offer of ABB (including A2 Biology and A2 Chemistry) and at least a B in GCSE Mathematics. However, the Department also has considerable flexibility in its admissions and offers policy, and strongly encourages non-standard applicants. Applicants who have passed the Science Foundation Year Programme, including Biology and Chemistry (providing the A level requirements have not already been met in both of these subjects), are also accepted onto this degree programme. Overseas students whose first language is not English must also have a qualification in English Language at an appropriate level. For further details please refer to the [Prospective Students](#) web page. It may also be helpful to contact the [Admissions Office](#) for specific guidance on the entrance requirements for particular programmes.

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### **Further learning and career opportunities**

Graduates from Biological Sciences degree programmes have successfully progressed into a wide range of professions, while many have continued onto Postgraduate studies. For further details please refer to the [Careers Service](#).

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### **Indicators of quality and standards**

Royal Holloway's position as one of the UK's leading research-intensive institutions was confirmed by the results of the most recent Research Assessment Exercise (RAE 2008) conducted by the Higher Education Funding Council (HEFCE). The new scoring system for the RAE 2008 measures research quality in four categories, with the top score of 4\* indicating quality that is world-leading and of the highest standards in terms of originality, significance and rigour. 60% of the College's research profile is rated as world-leading or internationally excellent outperforming the national average of 50%. The College is ranked 16th in the UK for research of 4\* standard and 18th for 3\* and 4\* research. The School of Biological Sciences was ranked joint 3<sup>rd</sup> in the top 10 universities in the country in terms of proportion of 3\* and 4\* research, with 70% of its research profile being of 3\* and 4\* standard.

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### **List of programmes offered by the School of Biological Sciences**

All the programmes are taught entirely by staff at Royal Holloway, University of London, and lead to awards of the University of London. Programmes in Biological Sciences are not subject to accreditation by a professional body. The QAA subject benchmark statement in Biosciences describes the general features which one might expect from Honours Degree programmes in the subject, and can therefore be used as a point of reference when reading this document (see [www.qaa.ac.uk](http://www.qaa.ac.uk)). UCAS codes are given in parentheses (see [www.ucas.ac.uk](http://www.ucas.ac.uk)).

## Single Honours Degree programmes in Biological Sciences taught wholly within the School of Biological Sciences

BSc Biochemistry (C700)	Available Full Time or Part Time
BSc Biology (C100)	Available Full Time or Part Time
BSc Biomedical Sciences (B990)	Available Full Time or Part Time
BSc Ecology and Environment (C150)	Available Full Time or Part Time
BSc Medical Biochemistry (C741)	Available Full Time or Part Time
BSc Molecular Biology (C701)	Available Full Time or Part Time
BSc Zoology (C300)	Available Full Time or Part Time

## Combined Honours Degree programme with Biological Sciences as a major component

BSc Biology with Psychology (C1C8)†

† Programme to be withdrawn with effect from September 2013

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