

## PROGRAMME SPECIFICATION

This document describes the **Honours Degree programme in Biochemistry**. This specification is valid for new entrants from **September 2018**.

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

- provide a sound knowledge and understanding of the molecular, cellular, and chemical principles of the subject through a core set of modules, and develop an insight into the current frontiers of knowledge, primarily through a series of second and more particularly specialised third year module options which focus on selected areas of topical importance in biochemistry;
- 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, or two years of part-time study, during which the student must follow modules to the value of 120 national credits. The curriculum is based around a core of mandatory modules 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 set of mandatory modules (totalling 90 credits) that seek to provide the necessary grounding for the study of the subject at degree level, with appropriate Chemistry and Biochemistry subjects in addition to an introduction to Genetics and Cell Biology. Students also select from a set of optional modules, to the value of 30 credits, which provides the option to include Introductory Animal Physiology and Pathophysiology or a module on the Green World: Plant Evolution, Form and Function. Stage one includes a strong element of laboratory training, with practical work in all modules, as well as providing support with the skills necessary for the study of biological sciences. In **Stage two** students take 75 credits in more advanced Biochemistry and Molecular Biology modules 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 modules 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 45 credits of optional modules, 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 two 15 credit mandatory modules, students select their remaining modules (to the value of 60 credits) from a list of options, thus allowing students to select from modules that reflect the research interests of internal and external staff, who are specialists in their field. The Biochemistry programme has the flexibility to allow students to select between topics with relevance to medical research and understanding, or to understanding the relevance of biochemistry within plants, or to include the more applied aspects of biochemistry such as biotechnology.

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 School up to the start of the second term, or indeed to other Molecular Bioscience degrees up to the start of the second year. Students can also take up to 30 credits from

outside the School of Biological Sciences, but within the Faculty of Science, during stage two/three. Options are selected in consultation with the student's Personal Tutor and the Director of Teaching.

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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 modules 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, microbiology, cancer, parasitology, plant biotechnology, immunology, developmental biology 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 modules 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.

Assessment is typically by formal unseen written examinations, practical exams and a range of coursework assignments such as essays, laboratory reports, poster preparation, oral presentations and the individual research project. Full details of the assessments for individual modules can be obtained from the [School](#).

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### **Details of the programme structure(s)**

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

**Stage one:**

Full-time students must take the following mandatory modules:

- BS1021 Becoming a Bioscientist (15 credits; condonable)
- BS1031 Chemistry of Life (15 credits; condonable)
- BS1032 Fundamental Biochemistry (15 credits; condonable)
- BS1071 Cell Biology and Evolution (15 credits; condonable)
- BS1072 Genetics (15 credits; condonable)
- BS1091 Protein Biochemistry and Enzymology (15 credits; condonable)

And choose 2 optional modules from the following Stage one modules:

- BS1043 Green World: Plant Evolution, Form and Function (15 credits)
- BS1061 Introductory Animal Physiology (15 credits)
- BS1062 Pathophysiology (15 credits)

Part-time students must take:

**Stage one (a):**

- BS1021 Becoming a Bioscientist (15 credits; condonable)
- BS1031 Chemistry of Life (15 credits; condonable)
- BS1032 Fundamental Biochemistry (15 credits; condonable)
- BS1091 Protein Biochemistry and Enzymology (15 credits; condonable)

**Stage one (b):**

- BS1071 Cell Biology and Evolution (15 credits; condonable)
- BS1072 Genetics (15 credits; condonable)

and choose options to the value of 30 credits from the Stage one modules listed above.

**Stage two:**

Full-time students must take the following mandatory modules:

- BS2510 Bioenergetics and Metabolism (15 credits; condonable)
- BS2520 Protein Structure and Function (15 credits; condonable)
- BS2530 Molecular Biology (15 credits; condonable)
- BS2570 Physical Biochemistry for Life Scientists (15 credits; condonable)
- BS2580 Plant Biochemistry and Biosynthesis (15 credits; condonable)

and choose 3 optional modules (45 credits) from the following Stage two modules:

- BS2005 Microbiology (15 credits)
- BS2020 Plant Life: From Genes to Environment (15 credits)
- BS2040 Cell Dynamics: Division and Movement (15 credits)
- BS2050 Human Physiology in Health and Disease (15 credits)
- BS2060 Developmental Biology (15 credits)
- BS2540 Molecular and Cellular Immunology (15 credits)
- BS2550 Neuronal and Cellular Signalling (15 credits)
- BS2560 Pharmacology and Toxicology (15 credits)

Part-time students must take:

**Stage two (a):**

- BS2510 Bioenergetics and Metabolism (15 credits; condonable)
- BS2520 Protein Structure and Function (15 credits; condonable)
- BS2530 Molecular Biology (15 credits; condonable)

and choose options equal to the value of 15 credits from the stage two modules listed above.

**Stage two (b):**

BS2570 Physical Biochemistry for Life Scientists (15 credits; condonable)

BS2580 Plant Biochemistry and Biosynthesis (15 credits; condonable)

and choose options equal to the value of 30 credits from the Stage two modules listed above.

**Stage three:**

Full-time students must take the following mandatory modules:

BS3010 Individual Research Project (30 credits) [Non-condonable fail – must be passed to qualify for specific field of study].

BS3420 Medical Biochemistry (15 credits; condonable)

BS3560 Functional Genomics, Proteomics, and Bioinformatics (15 credits; condonable)

and choose 4 optional modules (60 credits) from the following Stage three modules:

BS3020 Special Study: Dissertation (15 credits)

BS3030 Biology of Parasitic Diseases (15 credits)

BS3190 Climate Change: Plants and the Environment (15 credits)

BS3410 Industrial Biotechnology in a Changing World (15 credits)

BS3510 Molecular and Medical Microbiology (15 credits)

BS3520 Seed Biology: From Molecular & Conservation Biology to Industrial Applications (15 credits)

BS3530 Applications of Advanced Molecular Biology Methods (15 credits)

BS3540 Cell and Molecular Biology of Cancer (15 credits)

BS3570 Human Embryology and Endocrinology (15 credits)

BS3580 Cell and Molecular Neuroscience (15 credits)

BS3590 Molecular Basis of Inherited Disease (15 credits)

Part time students must take:

**Stage three (a):**

BS3010 Individual Research Project (30 credits) [Non-condonable fail – must be passed to qualify for specific field of study]

BS3420 Medical Biochemistry (15 credits; condonable)

BS3560 Functional Genomics, Proteomics, and Bioinformatics (15 credits; condonable)

**Stage three (b):**

Optional modules equal to the value of 60 credits from the Stage three modules listed above.

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**Progression and award requirements**

Students are considered for the award and classified on the basis of a weighted average. This is calculated from marks gained in modules taken in stages two and three, and gives twice the weighting to marks gained in stage three. The College's [Undergraduate Regulations](#) include full details on progression and award requirements for all undergraduate programmes offered by the College. In order to qualify for the award of Biochemistry degree, students must gain a weighted average of at least 35%, pass at least 90 credits in the final year and take the mandatory modules specified above. The Individual Research Project (BS3010) is mandatory, non-condonable. Students must pass this module in order to qualify for an Honours Degree in Biochemistry.

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**Student support and guidance**

- Personal Tutors: All students are allocated a Personal Tutor who meets with them regularly through the programme. The Personal Tutor'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 Tutor in tutorial groups of around 6 students, 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.
- Student representation is included on the Student-Staff Committee and the School Teaching Committee.
- Detailed student handbook and module resources are provided.
- Extensive supporting materials and learning resources are available in the College libraries, the Computer Centre and via the School website and Moodle.
- Dedicated teaching laboratories are housed in the School of Biological Sciences (Bourne) Building.
- The School of Biological Sciences has a Disability and Dyslexia Services (DDS) network member.
- College Careers and Employability 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 Disability and Dyslexia services for students with disabilities and Specific Learning Difficulties.

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### **Admission requirements**

Details of the Department's typical offer for each programme of study is available on the [Course Finder](#) web page. However, the Department also has flexibility in its admissions and offers policy and strongly encourages applications from non-standard applicants. Students whose first language is not English may also be asked for a qualification in English Language at an appropriate level. For further guidance it may also be helpful to contact the [Recruitment and Partnership Office](#).

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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 Excellence Framework (REF 2014) conducted by the Higher Education Funding Council (HEFCE). The scoring system for the REF 2014 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 and 3\* indicating research that is internationally excellent. 81% of the College's research profile was deemed to be within the 4\* or 3\* categories, an increase of over 20% since 2008. This result placed Royal Holloway 31st overall in the UK for 4\* and 3\* research and 33rd based on an overall Grade Point Average (GPA) score.

The School of Biological Sciences is ranked 34<sup>th</sup> in the UK for research of 4\* standard and 32<sup>nd</sup> for 3\* and 4\* research.

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### **List of programmes**

Programmes are taught almost entirely by staff at Royal Holloway University of London, with some third year modules including contributions from external lecturers who are experts in their subject area. All programmes lead to awards of the University of London. 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)).

BSc Biochemistry (C700)

Available Full Time or Part Time

### **Accreditation**

The Honours Degree programme in Biochemistry is accredited by the Royal Society of Biology.

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