

## PROGRAMME SPECIFICATION

This document describes the **Honours Degree programme in Medical Biochemistry**. This specification is valid for new entrants from **September 2015**.

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

- provide a sound knowledge and understanding of the molecular, cellular, physiological, chemical and biological principles of the subject through a core of courses, and develop an insight into the current frontiers of knowledge, primarily through a series of specialised level 3 courses;
- provide a sound knowledge and understanding of those areas of the subject relevant to understanding the biological basis, the diagnosis and the development of therapies for a range of diseases;
- 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 normally 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 roughly equivalent to 30 national credits). The curriculum is based around a core of mandatory units and there are strong foundations in stages one and two, which covers the requirements of the benchmarking statements in molecular biosciences and allows for specialisation in Stage three.

**Stage one** comprises 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 includes a strong element of laboratory training. In **Stage two** students take 6 core courses to the value of 3 course units and two optional half units (in Biochemistry and related subjects) building on the foundations laid in the stage one and provide a basis for the study of the research led specialist options in stage three. Again all courses include a substantial element of laboratory training that prepares the student for the selection and implementation of the independent research project in stage three. **Stage three** allows for increasing specialisation and there are 5 core courses to the value of 3 course units with students selecting the remaining courses from 5 half-unit options. Most of the core courses have a strong element of Medical Biochemistry, one of the courses on the Clinical Diagnosis of Disease is restricted to students following this degree stream or Biomedical Sciences, and are staffed by experts from local hospital laboratories. Students also complete an independent research project.

The programme emphasises the importance of biochemistry in medicine, together with the relevance of molecular and cellular biology and chemistry. The programme involves training in a variety of practical techniques and skills relevant to research work in molecular bioscience. The students specialise in medical aspects of the subject. 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 stage, and to Biochemistry at the end of Stage two.

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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, molecular biology and molecular genetics, cell-signalling, microbiology, cancer, parasitology, immunology, and gene therapy. In general terms the programme provides opportunities for students to develop and demonstrate the following learning outcomes:

### *Knowledge and understanding*

- a sound knowledge and understanding of those subjects essential for the scientific investigation and understanding of human disease, viz. biochemistry, cell biology, chemistry, genetics, molecular biology, and pharmacology
- 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 this discipline underlies much of the basis of modern medical biochemistry;
- an understanding of the structure and function of various sub-cellular structures and cell types in unicellular and multicellular organisms, the structure and function of cell membranes, cell organelles and 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;
- a knowledge of the application of biochemistry, molecular biology and molecular genetics to understanding the molecular basis and diagnosis of a range of diseases;
- 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 variety 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;\*
- 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;\*
- 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, a hospital visit, 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, through the General Information Technology Skills course.

Assessment is typically by formal unseen written examinations and coursework such as essays and laboratory reports, in addition to poster preparation, oral presentations and dissertations on core courses.

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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. Full details of each of the courses can be obtained from the [School](#).

#### **Stage one:**

Full-time students must take the following **mandatory** courses:

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

Part-time students must the following **mandatory** courses 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: Animal and Plant Physiology (1 unit)
- BS1070 Cell Biology and Genetics (1 unit)

#### **Stage two:**

Full-time students must take the following **mandatory** courses:

- BS2510 Bioenergetics, Biosynthesis and Metabolic Regulation (½ unit)
- BS2520 Protein Structure and Function (½ unit)
- BS2530 Molecular Biology (½ unit)
- BS2540 Molecular and Cellular Immunology (½ unit)
- BS2550 Neuronal and Cellular Signalling (½ unit)

BS2570 Physical Biochemistry for Life Scientists (½ unit)

and 2 optional courses from the following:

BS2040 Cell Biology (½ unit)

BS2060 Developmental Biology (½ unit)

BS2560 Pharmacology and Toxicology (½ unit)

Part-time students must take the following **mandatory** courses:

**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)

BS2540 Molecular and Cellular Immunology (½ unit)

BS2550 Hormonal and Neuronal Signalling (½ unit)

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

**Stage three:**

Full-time students must take the following **mandatory** courses:

BS3010 Individual Research Project (1 unit) (Non-condonable fail – must be passed in order to qualify for field of study).

BS3570 Human Embryology and Endocrinology (½ unit)

BS3580 Cell and Molecular Neuroscience (½ unit)

BS3590 Molecular Bases of Inherited Disease (½ unit)

BS3600 Clinical Diagnosis of Disease (½ unit)

and 2 optional courses from the following:

BS3020 Special Study: Dissertation (½ unit)

BS3030 Biology of Parasitic Diseases (½ unit)

BS3510 Molecular and Medical Microbiology (½ unit)

BS3530 Applications in Advanced Molecular Biology (½ unit)

BS3540 Cell and Molecular Biology of Cancer (½ unit)

Part time students must take:

**Stage three (a)**

BS3010 Individual Research Project (1 unit) (Non- condonable fail – must be passed in order to qualify for field of study).

BS3570 Human Embryology and Endocrinology (½ unit)

BS3580 Cell and Molecular Neuroscience (½ unit)

**Stage three (b)**

BS3590 Molecular Bases of Inherited Disease (½ unit)

BS3600 Clinical Diagnosis of Disease (½ unit)

and choose options equal to the value of a one unit 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 as outlined in the College's Undergraduate Regulations. Students must pass units to the value of at least three units on each stage of the programme. Failing marks of 30 – 39% can normally be condoned in up to 30 credits across stages 1 and 2. In the final stage failing marks in up to 30 credits can normally be condoned. However, 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 and this will put restrictions on courses in which failing marks can be condoned (see programme structure above for details). Additionally there are requirements on the number of courses that must be passed in order to qualify for particular joint or combined Honours degrees. In order to qualify for the award of Medical Biochemistry degree, students must gain a weighted average of at least

35% pass in at least 3 Units in the final year including passing individual Research Project and take the core courses specified above. Please note that the individual Research Project cannot be compensated (that is, cannot be condoned) in order to qualify for an Honours Degree in Medical Biochemistry.

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. The College's Undergraduate Regulations include full details on progression and award requirements for all undergraduate programmes offered by the College.

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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 (2013/14).
- 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 Disability and Dyslexia Service for students with special needs.

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### **Admission requirements**

Admission to the programme normally requires at least 320 UCAS 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 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 was ranked joint 3<sup>rd</sup> in the top 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

## Accreditation

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

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