

PROGRAMME SPECIFICATION

This document describes the **Honours Degree programme in Molecular Biology**. This specification is valid for new entrants from **September 2016**.

The aims of the Honours Degree programme in Molecular Biology are to:

- provide a sound knowledge and critical understanding of molecular biology and molecular genetics 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 an understanding of how the principles of genetics underlie much of the basis of modern molecular biology;
- provide knowledge of the essential chemical principles that underlie molecular biology and biochemistry;
- provide a sound knowledge of biochemistry and a critical understanding of selected aspects of this subject;
- 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 120 national credits. The curriculum is based around a core set of mandatory units and there is a strong foundation in Stages one and two, which covers the requirements of the benchmarking statements in molecular aspects of molecular biosciences.

Stage one comprises a fixed selection of mandatory 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, Genetics, and Cell Biology. It also includes a strong element of laboratory training. In **Stage two** students take 4 core courses to the value of 60 credits and choose the remaining credits from a list of options. The mandatory courses build on the foundations laid in stage one and provide a basis for the study of the research led specialist courses in the stage three. Again the courses all include a substantial element of laboratory training that prepares the student for the selection and implementation of the independent research project in stage three. The optional courses allow the students to either concentrate on molecular biology or to diversify into other areas depending on their interests. In **Stage three** students complete an independent research project, take 4 other mandatory courses to the value of 60 credits, and the remaining 30 credits from a list of options. The mandatory courses all have a strong molecular basis.

The programme emphasises the importance of molecular biology in the study of biology and biochemistry. It includes training in a range of practical techniques and skills relevant to research work in molecular bioscience. 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 stage two. 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 advisor 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 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 molecular biology and molecular genetics, cell signalling, microbial genetics, cancer, neuroscience, parasitology, 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

- understanding of the essential molecular, cellular, physiological and chemical principles that underlie biochemistry and molecular biology;
- a critical understanding of the molecular basis of genetics;
- a knowledge and critical understanding of the structure, arrangement, expression and regulation of genes, and techniques used to investigate these subjects;
- a critical knowledge of the importance of molecular biology and molecular genetics to the development and genetic manipulation of organisms, and to the understanding of human disease;
- an understanding of the principles that determine the three-dimensional structure of biological macromolecules and how this is related to their biological functions;
- an understanding of biological catalysis and the role of enzymes and other proteins in determining function and fate of cells and organisms;
- a knowledge of cell metabolism, including its control;
- an understanding of the structure and function of various cell types in unicellular and multicellular organisms, and the structure and function of cell membranes, cell organelles and cell differentiation;
- 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 Molecular Biology and Genetics, and Biochemistry;
- working safely in a scientific laboratory, with awareness of standard safety protocols;
- the ability to employ and evaluate suitable experimental methods for the investigation of relevant areas of molecular biology, molecular genetics and biochemistry;
- the ability to apply relevant numerical skills, including statistics to biological and chemical data;
- the ability to access bioscience 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 molecular biology, 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 team/group work 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 molecular biology 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, 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.

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

Stage one:

Students must take the following mandatory courses:

BS1030 Principles of Molecular Bioscience (30 credits)

BS1060 Living Systems: Animal and Plant Physiology (30 credits)

BS1070 Cell Biology and Genetics (30 credits)

BS1090 Biochemistry: the Molecular Basis of Life (30 credits)

Part time students must take:

Stage one (a):

BS1030 Principles of Molecular Bioscience (30 credits)

BS1090 Biochemistry: the Molecular Basis of Life (30 credits)

Stage one (b):

BS1060 Living Systems: Animal and Plant Physiology (30 credits)

BS1070 Cell Biology and Genetics (30 credits)

Stage two:

Full-time students must take:

BS2040 Cell Biology (15 credits)

BS2150 Applications of Molecular Genetics in Biology (15 credits)

BS2520 Protein Structure and Function (15 credits)

BS2530 Molecular Biology (15 credits)

and 4 options from the following to the value of 60 credits:

BS2005 Microbiology (15 credits)

BS2020 Plant Life: from Genes to Environment (15 credits)

BS2050 Essential Human Physiology in Health and Disease (15 credits)

BS2060 Developmental Biology (15 credits)

BS2160 Evolution (15 credits)

BS2510 Bioenergetics, Biosynthesis and Metabolic Regulation (15 credits)

BS2540 Molecular and Cellular Immunology (15 credits)

BS2550 Neuronal and Cellular Signalling (15 credits)

Part-time students must take:

Stage two (a)

BS2150 Applications of Molecular Genetics in Biology (15 credits)

BS2520 Protein Structure and Function (15 credits)

and choose options equal to the value of 30 credits from the stage two courses listed above

Stage two (b)

BS2040 Cell Biology (15 credits)

BS2530 Molecular Biology (15 credits)

and choose options equal to the value of 30 credits from the stage two courses listed above

Stage three:

Full-time students must take:

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

BS3530 Applications of Advanced Molecular Biology Methods (15 credits)

BS3540 Cell and Molecular Biology of Cancer (15 credits)

BS3560 Functional Genomics, Proteomics and Bioinformatics (15 credits)

BS3590 Molecular Basis of Inherited Disease (15 credits)

and 30 credits from the following:

BS3020 Special Study: Dissertation (15 credits)

BS3030 Biology of Parasitic Diseases (15 credits)

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

BS3510 Molecular and Medical Microbiology (15 credits)

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

BS3570 Human Embryology and Endocrinology (15 credits)

BS3580 Cell and Molecular Neuroscience (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].

BS3530 Applications of Advanced Molecular Biology Methods (15 credits)

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

Stage three (b)

BS3540 Cell and Molecular Biology of Cancer (15 credits)

BS3590 Molecular Basis of Inherited Disease (15 credits)

and choose options equal to the value of 30 credits from the stage three courses 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 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.

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.

The Individual Research Project (BS3010) is mandatory, non-condonable. Students must pass this course in order to qualify for an Honours Degree in Molecular Biology.

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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 1:16 (2015/16).
- 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 Disability and Dyslexia (DDS) network members.
- College Careers Service and School Employability Tutor 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 34th in the UK for research of 4* standard and 32nd for 3* and 4* research.

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List of programmes offered by the School of Biological Sciences

Programmes are taught almost entirely by staff at Royal Holloway University of London, with some third year courses 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). UCAS codes are given in parentheses (see www.ucas.ac.uk).

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

BSc Molecular Biology (C701)

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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