

PROGRAMME SPECIFICATION

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

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

- provide a sound knowledge and critical understanding of molecular biology through a core of course units, and develop an insight into the current frontiers of knowledge, primarily through a series of specialised Stage 3 course units;
- provide an understanding of how the principles of molecular biology underlie much of the basis of modern research and have informed our biological and cellular understanding;
- provide knowledge of the essential biochemical principles that underlie molecular biology;
- 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 course units to the value of 120 national credits. The curriculum is based around a core set of mandatory course units and there is a strong foundation in Stages one and two, which covers the requirements of the benchmarking statements in molecular aspects of the biosciences.

Stage one comprises a fixed selection of mandatory course units (totalling 75 credits) and seeks 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 course units, to the value of 45 credits, which provides the option to include Physiology, Protein Biochemistry and Enzymology, Biology in a Changing World or a module on the Green World: Plant Evolution, Form and Function, depending on individual interests. Stage one also includes a strong element of laboratory training, with practical work in all course units, as well as providing support with the skills necessary for the study of biological sciences. In **Stage two** students take 4 mandatory course units to the value of 60 credits and choose the remaining credits from a list of options. The mandatory course units build on the foundations laid in stage one and provide a basis for the study of the research led specialist course units in the stage three. Again the course units 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. The optional course units 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 individual research project, take 2 other mandatory course units to the value of 30 credits, and the remaining 60 credits from a list of options. The mandatory and optional course units available all have a strong molecular basis, but include topics as diverse as Industrial Biotechnology, Circadian Biology, Seed Biology and Molecular and Medical Microbiology.

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 School up to the start of the second term, or indeed to other Molecular Bioscience degrees 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 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 course units 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, molecular genetics, cell signalling, microbiology, cancer, plant genetics and biotechnology, 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 molecular biology;
- a knowledge and critical understanding of the structure, arrangement, expression and regulation of genes, and techniques used to investigate and manipulate gene function ;
- a critical knowledge of the importance of molecular biology to the development and genetic manipulation of organisms, and to the understanding of 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 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;
- an understanding of the application of molecular biology in diverse areas of research, and how this has influenced our understanding of biological function or provided avenues to help ensure global sustainability;
- 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;
- 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;

- the ability to apply relevant numerical skills, including statistics to biological and biochemical 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 course units 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 individual research project. Full details of the assessments for individual course units can be obtained from the [School](#).

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Details of the programme structure(s)

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

Stage one:

Full-time students must take the following mandatory course units:

- 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)

And choose 3 optional course units (45 credits) from the following Stage one course units:

- BS1041 Biology in a Changing World (15 credits)
- BS1043 Green World: Plant Evolution, Form and Function (15 credits)
- BS1061 Introductory Animal Physiology (15 credits)
- BS1062 Pathophysiology (15 credits)
- BS1091 Protein Biochemistry and Enzymology (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)
- and choose options to the value of 15 credits from the Stage one course units listed above.

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 course units listed above.

Stage two:

Full-time students must take the following mandatory course units:

- BS2040 Cell Dynamics: Division and Movement (15 credits; condonable)
- BS2150 Applications of Molecular Genetics in Biology (15 credits; condonable)
- BS2520 Protein Structure and Function (15 credits; condonable)
- BS2530 Molecular Biology (15 credits; condonable)

and choose 4 optional course units (60 credits) from the following Stage 2 course units:

- BS2005 Microbiology (15 credits)
- BS2020 Plant Life: From Genes to Environment (15 credits)
- BS2050 Human Physiology in Health and Disease (15 credits)
- BS2060 Developmental Biology (15 credits)
- BS2160 Evolution (15 credits)
- BS2510 Bioenergetics and Metabolism (15 credits)
- BS2540 Molecular and Cellular Immunology (15 credits)
- BS2550 Neuronal and Cellular Signalling (15 credits)
- BS2560 Pharmacology and Toxicology (15 credits)
- BS2580 Plant Biochemistry and Biosynthesis (15 credits)

Part-time students must take:

Stage two (a)

- BS2150 Applications of Molecular Genetics in Biology (15 credits; condonable)
 - BS2520 Protein Structure and Function (15 credits; condonable)
- and choose options equal to the value of 30 credits from the stage two course units listed above

Stage two (b)

- BS2040 Cell Dynamics: Division and Movement (15 credits; condonable)
 - BS2530 Molecular Biology (15 credits; condonable)
- and choose options equal to the value of 30 credits from the stage two course units listed above

Stage three:

Full-time students must take the following mandatory course units:

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

BS3540 Cell and Molecular Biology of Cancer (15 credits; condonable)

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

and choose 4 optional course units (60 credits) from the following Stage 3 course units :

BS3020 Special Study: Dissertation (15 credits)

BS3030 Biology of Parasitic Diseases (15 credits)

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

BS3230 Circadian Biology (15 credits)

BS3410 Industrial Biotechnology in a Changing World (15 credits)

BS3420 Medical Biochemistry (15 credits)

BS3510 Molecular and Medical Microbiology (15 credits)

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

BS3530 Applications of Advanced Molecular Biology Methods (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].

BS3540 Cell and Molecular Biology of Cancer (15 credits; condonable)

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

Stage three (b)

Options equal to the value of 60 credits from the stage three course units 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 course units 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 Molecular Biology degree, students must gain a weighted average of at least 35%, pass at least 90 credits in the final year and take the mandatory course units specified above. The Individual Research Project (BS3010) is mandatory, non-condonable. Students must pass this course unit in order to qualify for an Honours Degree in Molecular Biology.

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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 Staff-Student 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 (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 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 course units 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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