**THE PROGRAMME SPECIFICATION**

### 1. Programme title and designation

<table>
<thead>
<tr>
<th>Single honours</th>
<th>Joint</th>
<th>Major/minor</th>
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<tbody>
<tr>
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<tr>
<td>Pharmacology and Molecular Genetics with extra Mural Year</td>
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### 2. Final award

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<tr>
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<th>ECTS Equivalent</th>
<th>Any special criteria</th>
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### 5. Level in the qualifications framework

H

### 6. Attendance

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<td>Maximum length of programme</td>
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### 7. Awarding institution/body

King’s College London

### 8. Teaching institution

King’s College London

### 9. Proposing department

Pharmacology & Therapeutics

Biochemistry

### 10. Programme organiser and contact

Dr Stewart Paterson

PAF Originally Approved by QA&AA: 1 June 2007
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PAF modified re: exit awards, progression rules, module table: 22 August 2012
PAF finalised for 2012/13: 22 August 2012
PAF modified by QAS for 2016/17: 11th April 2013
16. Educational aims of the programme

1. Provide graduates with a clear and comprehensive knowledge of the effects and mode of action of drugs and an understanding of the methods by which the mode of action of drugs is investigated.
2. Provide an in depth knowledge of fundamental aspects of genetics and genomics, as applied to a range of organisms including humans, and an understanding of research methods in these subjects.
3. Instil a clear understanding of the importance of experimental design and statistical analysis.
4. Provide practical experience in some of the techniques used in pharmacology and molecular genetics, and equip graduates with the skills to progress to postgraduate study and/or employment in areas such as the biotechnology or pharmaceutical industry and scientific publishing.
5. Provide an appreciation of the history of pharmacology and genetics and inculcate in students a lifelong interest in scientific advances in these fields.
6. Develop the written and oral presentation skills of students in the communication of scientific literature and instil a critical approach to the reading of biomedical research papers.
7. Continue to develop areas of teaching in response to the advance in scientific scholarship and the needs of the community.
8. Develop an understanding of the ethical and safety issues surrounding research in the general areas of pharmacology and genetics, and the potential ethical, legal and social impact of modern genetics on human society.
9. Provide the opportunity to carry out an extra-mural year of research.

17. Educational objectives of the programme/programme outcomes

The programme provides opportunities for students to develop and demonstrate knowledge and understanding and skills in the following areas:

**Knowledge and understanding**

The programme provides a knowledge and understanding of the following:

1. The elements of the physiology and biochemistry of the major systems of the mammalian body that are important for a clear understanding of the mode of action of drugs.
2. The pathology of some of the major diseases that affect the main systems of the mammalian body, such as the central and peripheral nervous systems, the

These are achieved through the following teaching/learning methods and strategies:

The background knowledge of physiology, cell biology, and biochemistry is acquired during the common first year modules which involve lectures, laboratory based practicals and small group teaching (tutorials, problem solving workshops) and CAL programmes (1, 2, 3, 4, 8).

The basic pharmacology of the first year is developed in the second year through a 30 credit module that covers the principal groups of therapeutic agents (Drugs & Disease; 2, 3, 7) and
cardiovascular, respiratory, renal, and immune systems.

3. The mode of action of the main drug groups and how they are applied in the treatment of disease.

4. Principles of inheritance, the nature and mode of action of genes and the organisation and function of genomes.

5. The techniques and procedures used in the application of genetics and genomics to discovering the causes, improving the diagnosis and developing the treatment of disease.

6. The techniques and procedures that are used in both the pharmaceutical industry and in academic institutions for the investigation of drug action and the development of new therapeutic agents.

7. The processes involved in scientific discovery and the importance of developing an appreciation of new concepts and hypotheses.

8. The ethical and safety issues surrounding research in pharmacology and genetics.

9. The potential ethical, legal and social impact of modern genetics on human society.

10. The issues involved in carrying out an extensive research project and the procedures associated with the presentation of the results obtained during the project in a dissertation.

a specialist 15 credit module (Drug Discovery & Development).

In the latter a number of lectures are given by expert visitors from the pharmaceutical industry with the aim of providing students with first-hand information on the drug discovery process. In addition, students carry out a series of laboratory practical sessions from which they keep a lab notebook, written to Good Laboratory Practice standards (6, 7, and 8).

The basic genetics in the first year is developed in the second year through a 30 credit module (Human & Molecular Genetics). This module compares single gene and multifactorial inheritance, covers the basic genetics of human populations and explores technical and ethical aspects of gene identification, functional genomics, genetic testing and genetic screening (4, 5, 7, 8, and 9). This module includes a laboratory practical in which students experience the use of the Polymerase Chain Reaction to analyse human genetic variation and explore its potential as a diagnostic tool. (5, 7, 8).

In a 15 credit module (Gene Cloning) lectures and tutorials on genetic and genomic techniques are reinforced by an extended laboratory practical run over several weeks, for which students submit a written report. (5, 7, 8)

In the final year, lectures remain important, but students are expected to extend their knowledge through independent study of original research papers and the majority carry out a research project. (1, 2, 3, 4, 5, 7, 8).

Students may elect to carry out an extra-mural year research project between the second and final year; they submit a dissertation based on the results of that project (5, 6, 7, 8, and 10).

**Assessment:**

Formative tests are held during tutorials in the first few weeks of the common first year with a summative MCQ at the end of the first semester.
End of first year assessments involve MCQ tests with some marks coming from write-ups of laboratory-based experiments and statistical workshops. In the second and final years, assessment is largely by unseen written examinations plus course work that can involve oral or poster presentations and practical write-ups.

Project work is assessed by the written report.

The extra-mural year is assessed by the written dissertation and an oral presentation.

Viva voce examinations are given to borderline final year students with the agreement of visiting examiners.

Skills and other attributes

**Intellectual skills:**

1. Appreciation of the input from related disciplines, such as physiology, anatomy, biochemistry and immunology, to the study of pharmacology and genetics.
2. Ability to evaluate, critically, research papers and to present complex ideas raised by research publications, either orally or in writing.
3. Ability to design experiments, analyse results statistically and to present research findings both orally and in writing.
4. Understanding of hypothesis driven science.

These are achieved through the following teaching/learning methods and strategies:

Appropriate lectures at which interaction between different disciplines is emphasised (1, 4).

Experimental design and analysis of results are introduced in the common first year and are a vital aspect of the final year experimental project.

The common first year also includes instruction on essay writing and oral presentations (3, 4).

Research papers become an increasingly essential source of information as the student progresses through the programme (2, 4).

Students give their first oral presentation during first year and develop these skills through oral and/or poster presentations in subsequent years (2, 3).

**Assessment:**

Intellectual skills are assessed within unseen examination papers, oral and poster presentations, and in both library and practical projects.
Practical skills:

1. Basic laboratory skills of drug dilution and maintenance of biological tissue in vitro.
2. Basic laboratory skills used for the analysis of genetic material and manipulation of cloned DNA.
3. Planning and executing a laboratory investigation on isolated tissue.
4. Computer skills, to include e-mail, word processing, preparation of data presentations, spreadsheets, graph plotting, and statistical analysis.
5. For some students, the handling of animals and their use in research.
6. For some students, basic use of bioinformatics techniques.

For those students taking the extra-mural year, some of these skills will be assessed in their written dissertation.

These are achieved through the following teaching/learning methods and strategies:

Basic laboratory and computer skills are covered in the common first year and all students will undertake laboratory-based experiments in their second year (1, 2, 3, and 4).

In the final year it is possible for students to select a combination of modules that do not incorporate laboratory-based practical sessions whilst others can follow a more practically-orientated pathway that incorporates a research project and/or modules with a significant laboratory component. Student choice is informed by career aspirations and by discussions with module advisors. Research projects involving work with whole animals require the student to attend and pass a Home Office personal licence training course on animal handling (3, 4, and 5).

Assessment:

Written reports of experimental work are assessed for both experimental skills and computer skills as part of course work or as the report on a research project.

The practical skills of the extra-mural students are assessed by their dissertation and a short report from their industrial supervisor.

Generic/transferable skills:

1. Evaluation of the logical strength of a scientific argument.
2. Time management and organisational skills.
3. Oral and written communication skills.
4. Computer skills e.g. e-mail, internet use of search engines/strategies.
5. Library skills.

These are achieved through the following teaching/learning methods and strategies:

Oral presentations in each year (3, 4).

Tutorials (1, 2, 6, 7).

Laboratory practicals conducted in pairs or small groups in years one and two (6, 7).

Most students complete a final year project, either library based or experimental (1, 2, 3, 4).
6. Data analysis skills.
7. Interpersonal skills.

These skills are an important aspect of the extra-mural year (1, 2, 3, 4, 5, 6, and 7).

**Assessment:**
Formative and summative assessment of oral presentations. Projects, essays, posters.

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**18. Statement of how the programme has been informed by the relevant subject benchmark statement(s)/professional, regulatory and statutory body guidelines**

There is no professional accreditation programme for Pharmacology, Molecular Genetics, or for a combined programme, but the programme structure and content has been compared to and conforms to the relevant Biosciences Benchmark Statement.

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**19. Programme structure and award requirements** (where relevant the information should also differentiate the particular requirements of pathways within a programme or nested/exit awards)

(a) numbers of introductory, core, compulsory and optional modules to be taken in each year of the programme with related credit values

**BSc Pharmacology & Molecular Genetics**

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
<th>Credits</th>
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<tr>
<td>1</td>
<td>2 core and 5 compulsory</td>
<td>120</td>
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<tr>
<td>2</td>
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OR – Year Aboard - Year abroad in an associated institution, equivalent 120 credits (modules approved by Programme Adviser)

<table>
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<tr>
<th>Final Year</th>
<th>Modules</th>
<th>Credits</th>
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<tr>
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<td>3 compulsory</td>
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The remaining credits are optional and should be selected following guidance by the Programme Adviser.

**BSc Pharmacology & Molecular Genetics (with extra Mural Year)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
<th>Credits</th>
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<tbody>
<tr>
<td>1</td>
<td>2 core and 5 compulsory</td>
<td>120</td>
</tr>
<tr>
<td>2</td>
<td>5 compulsory</td>
<td>120</td>
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</table>

OR – Year Aboard - Year abroad in an associated institution, equivalent 120 credits (modules approved by Programme Adviser)

<table>
<thead>
<tr>
<th>Year</th>
<th>Modules</th>
<th>Credits</th>
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<tbody>
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<table>
<thead>
<tr>
<th>Final Year</th>
<th>Modules</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>3</td>
<td>3 compulsory</td>
<td>60</td>
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</table>

The remaining credits are optional and should be selected following guidance by the Programme Adviser.
the Programme Adviser.

(b) range of credit levels permitted within the programme
Levels 4, 5 and 6

(c) maximum number of credits permitted at the lowest level
150 credits

(d) minimum number of credits required at the highest level
90 credits (150 for extra mural year)

(e) progression and award requirements (if different from the standard)

Year 1: 90 credits but must include 2 core modules.

Year 2: 210 credits but must include 4 core modules.

Year 3: 360 credits but must pass 15 credits in Pharmacology modules and 15 credits in Biochemistry modules.

(f) maximum number of credits permitted with a condoned fail (core modules excluded)
45 (unless a smaller number is required under the School Board's Policy on Condonement).

(g) are students permitted to take a substitute module, as per regulation A3, 20.7?
Yes

(h) other relevant information to explain the programme structure

Students are admitted into the first year registered for the BSc Pharmacology and Molecular Genetics programme, and take the Common First Year.

In the second year, students take five compulsory modules. Students must pass at least 15 credits of Pharmacology (BM module prefix) modules and 15 credits of Biochemistry (BB module prefix) modules from the compulsory list.

Students have the option to spend their second year abroad at another institution. Students are able to choose from a list of Institutions that have been approved by Academic Board. Students must select appropriate equivalent compulsory modules at their Exchange university (equal to 120 credits). Marks gained at the overseas institution will not contribute towards the C-Score calculated for the student. In line with the College approved “Credit Transfer” model for the translation of marks attained through study away from College, the candidate will be required to pass modules taken overseas in order to satisfy progression requirements.

During second year, students may ask to be considered for an extra-mural year. If successful they will be transferred to the BSc Pharmacology & Molecular Genetics with Extramural Year, and the placement will occur between the second and final year. The extra-mural year
Programme approval 2006/07

will be assessed by dissertation on a PASS/FAIL basis (40%), and the mark will not contribute to the final degree classification. Students who pass the dissertation will continue into final year still registered for the BSc Pharmacology & Molecular Genetics with Extramural Year. Students who fail the dissertation will continue into final year registered for the BSc Pharmacology & Molecular Genetics.

In the final year, students must take three compulsory modules. In addition, students must take a project from the following list: 6BBM0338, 6BBG0303, 6BBG0308, 6BBG0309, 6BBB0320, 6BBB0321, 6BBM0319, 6BBM0335 and 6BBM0340. Students must pass at least 15 credits of Pharmacology and Biochemistry modules. The remaining credits to be selected from an available list of options.

To proceed from year one to year two students will normally be required to pass a minimum of 90 credits, with any remaining credits within the condoned fail range (a mark greater than 32%).

To proceed from the year two to year three, a student will normally be required to pass a minimum of 210 credits with any remaining credits within the condoned fail range (a mark greater than 32%)

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PAF modified by QAS for 20163/14: 11th April 2013
Programme approval 2006/07

Programme structure

<table>
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<th>Title</th>
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<th>Status (I, C, O) for each type of programme</th>
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<td>6BBM0329 Cellular Basis of Drug Dependence</td>
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<table>
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<td>6</td>
<td>30</td>
<td>Experimental Cardiovascular Pharmacology</td>
<td>O</td>
<td>O</td>
<td>No</td>
<td>Written exam; coursework</td>
</tr>
<tr>
<td>6BBM0326</td>
<td>6</td>
<td>15</td>
<td>Pharmacology of Inflammation</td>
<td>O</td>
<td>O</td>
<td>No</td>
<td>Written exam; coursework</td>
</tr>
<tr>
<td>6BBM0327</td>
<td>6</td>
<td>30</td>
<td>Experimental Pharmacology of Inflammation</td>
<td>O</td>
<td>O</td>
<td>No</td>
<td>Written exam; coursework</td>
</tr>
<tr>
<td>6BBM0331</td>
<td>6</td>
<td>15</td>
<td>Pharmacology of Neurological &amp; Psychiatric Disorders</td>
<td>O</td>
<td>O</td>
<td>No</td>
<td>Written exam; coursework</td>
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<tr>
<td>6BBYG307</td>
<td>6</td>
<td>15</td>
<td>Immunogenetics and Cancer Genetics</td>
<td>O</td>
<td>O</td>
<td>No</td>
<td>Written exam; coursework</td>
</tr>
<tr>
<td>6BBF0300</td>
<td>6</td>
<td>15</td>
<td>Forensic Genetics and Toxicology</td>
<td>O</td>
<td>O</td>
<td>No</td>
<td>Written exam; coursework</td>
</tr>
<tr>
<td>6BBM0310</td>
<td>6</td>
<td>15</td>
<td>Drug Safety and Toxicology</td>
<td>O</td>
<td>O</td>
<td>No</td>
<td>Written exam; coursework</td>
</tr>
<tr>
<td>6BBF0300</td>
<td>6</td>
<td>15</td>
<td>Forensic Genetics and Toxicology</td>
<td>O</td>
<td>O</td>
<td>No</td>
<td>Written exam; coursework</td>
</tr>
<tr>
<td>6BBA0381</td>
<td>6</td>
<td>30</td>
<td>Biology of Cancer</td>
<td>O</td>
<td>O</td>
<td>No</td>
<td>Written exam; coursework</td>
</tr>
<tr>
<td>All other modules within/out with the School to include Modern Languages</td>
<td>4.5</td>
<td>15, 30</td>
<td>O</td>
<td>O</td>
<td>No</td>
<td>Various</td>
<td></td>
</tr>
</tbody>
</table>

* Students must take a project from the following list: Extended Research Project in Genetics, Pharmacology Research Project B, Project Design in Pharmacology and Extended Pharmacology Research Project B or Pharmacology Library Project.

** Students are expected to pass at least 15 credits Pharmacology modules and 15 credits Biochemistry modules from the compulsory list.

*** Students must take either 6BBM0314 or 6BBBM0329.

PAF Originally Approved by QA&AA: 1 June 2007
PAF Approved for 2008/9 by QA&AA: 19 September 2008
PAF Approved for 2009/10 by QA&AA: 3rd September 2009
PAF modified by ASQ re: exit awards: 15th April 2010
PAF finalised for 2011/12: 23 August 2011
PAF modified re: 17 February 2012
PAF modified re: exit awards, progression rules, module table: 22 August 2012
PAF finalised for 2012/13: 22 August 2012
PAF modified by QAS for 20163/14: 11th April 2013
20. Marking criteria

All modules will be marked in accordance with the School’s marking criteria where such exist, or else in accordance with the College’s generic marking criteria.

21. Particular features of the programme which help to reduce the barriers experienced by disabled students and ensure that the programme is accessible to all students who meet the entry requirements

Admissions
All students in receipt of an offer receive an information booklet on the support services offered by the College.

All students receiving offers who have indicated they have a disability in their application receive a letter from the School Disability Adviser with his/her contact details and offering the applicant the opportunity to discuss their requirements.

Structure
The programme is offered on a part-time basis.

Publicity and Programme Material
These clearly communicate the key skills that will be required during the programme, the content of each module, the intended teaching methods to be used and module status (core/compulsory/optional).

Teaching Methods
A wide range of teaching methods is utilised (as demonstrated by box 17).

Assessment
Advice has been taken from the Equality & Diversity Department to ensure assessment methods do not unfairly discriminate against students with disabilities. The College’s Special Examination Assessment Committee (SEAC) considers requests for adjustments to assessment to take account of learning and/or physical disabilities. Module outlines specify the assessment methods that will be used and explain that SEAC will need to be notified about requests for alternative assessment methods. The form that the alternative assessment will take has been specified for each module in advance.

Feedback
Feedback on the programme is regularly collected from students about their learning experience. The information collected is used towards the on-going development and improvement of the programme. In particular, it has prompted closer working with ISS to ensure that subject resources are offered in a range of alternative formats wherever possible.
Not all of the information in this section will be relevant for all programmes and for some programmes this section will not be relevant at all.

1. **Programme name**
   - BSc Pharmacology and Molecular Genetics/
   - BSc Pharmacology and Molecular Genetics with Extra-Mural Year

2. **If the programme is a joint award with an institution outwith the University of London has the necessary approval been sought from Academic Board?**
   - Yes [ ]
   - No [ ]
   - Not applicable [X]
   - Please attach a copy of the request to Academic Board

3. **In cases of joint honours programmes please provide a rationale for the particular subject combination, either educational or academic**
   - To provide an undergraduate programme which generates graduates conversant with both:
     - (i) the concepts and techniques of molecular biology and genomics and
     - (ii) the concepts, techniques and applications of pharmacology.
   - Graduates with such skills would be able to contribute usefully in many interesting and valuable scientific projects such as:
     - (a) the design of new therapeutic agents using molecular understanding of likely drug target sites;
     - (b) the development and construction of transgenic animal models for the elucidation of the role of specific gene products in normal function and the subsequent use of such models to elucidate how established and novel drugs may benefit patients in whom a deficiency of that same gene product contributes towards their pathology;
     - (c) the application of molecular techniques to discover interesting “orphan” genes and the subsequent application of biomedical/pharmacological reasoning and experimentation to elucidate and test the functional role of such genes;
     - (d) to study and further the understanding of how genotypic variation may influence an individual’s response to drugs: such knowledge may be used to tailor drug development and drug-prescribing in relation to the established genotype of individual patients (pharmacogenomics);
     - (e) to investigate, and be in a position to predict, potential for toxicity following human exposure to specific chemicals/drugs by inference from the effect of the chemical/drug on the pattern of specific gene expression of cells/tissues in vitro (using DNA microarrays - toxicogenomics).
The degree programme is designed to merge key modules from those currently provided by the Departments of Biochemistry and Pharmacology and Therapeutics. Major themes will be: firm foundations in chemistry, molecular cell biology, genetics, physiology, and pharmacology (both conceptual and applied/systematic); the structures of biological macromolecules; gene structure; the prediction of structural and functional properties of proteins from amino acid/gene sequence data; gene cloning, particularly in relation to receptors and cell signalling pathways of interest to pharmacologists; drug design and development; an understanding of techniques in molecular biology and pharmacology, and development of personal, practical skills, by early exposure to modules with some practical content, and extended through, either an appropriate extra-mural year, or a final year experimental project.

**Which is the lead department and/or School?**
Pharmacology & Therapeutics, School of Biomedical and Health Sciences

### 4. If the programme involves time outside the College longer than a term, please indicate how the time will be spent, the length of time out and whether it is a compulsory or optional part of the programme

<table>
<thead>
<tr>
<th>Year abroad</th>
<th>Year in employment</th>
<th>Placement</th>
<th>Other (please specify)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Time spent: 1 academic year in Australia, Hong Kong, Singapore, Sweden, or USA; optional.

### 5. Please provide a rationale for any such time outside the College, other than that which is a requirement of a professional, regulatory or statutory body

Students have the option to undertake their second year at a partner Higher Education Institution overseas, to broaden their opportunities and experiences. During their year abroad students are expected to choose modules equivalent to the Year 2 core modules, in order to progress into the Final Year on their return.

Students can undertake an extramural placement in a research laboratory in the UK or overseas during the third year of the BSc Pharmacology & Molecular Genetics (with extra Mural Year). These are laboratories known to staff of the Pharmacology or Biochemistry Departments and have usually taken King’s students for many years. During their year away from College the student works under the direction of a senior member of the laboratory and also has a supervisor from the Department who makes at least one visit. The experience of working on a day to day basis in a research laboratory is invaluable both to those students who intend to pursue a career in research and for those who are still considering their career options.
6. Please give details if the programme requires validation or accreditation by a professional, regulatory or statutory body

N/A