Programme Title: Pharmaceutical Chemistry (MSci)

Programme Specification

Awarding Body/Institution: Queen Mary, University of London
Teaching Institution: Queen Mary, University of London
Name of Final Award and Programme Title: MSci Pharmaceutical Chemistry
Duration of Study / Period of Registration: 4 years
QM Programme Code / UCAS Code(s): UMIF-QMCHEM1/USPHC (F152)
QAA Benchmark Group: Chemistry
FHEQ Level of Award: Level 7
Programme Accredited by: Recognised by Royal Society of Chemistry
Date Programme Specification Approved: 22 May 2012
Responsible School / Institute: School of Biological & Chemical Sciences

Programme Rationale

This MSci programme aims to provide a comprehensive training in the field of chemistry with an introduction to key principles of biochemistry, physiology and pharmacology. Emphasis is given to molecular concepts of complex biological systems and the relevance of all the above to the development of medicinal drugs. Students following this program will therefore learn about important chemical principles and their relationship to biological systems, and are well-trained for careers in the pharmaceutical industry.

The final year of the MSci programme provides students with the opportunity to undertake a major research project, and experience of working in a research environment. The project also typically includes training in more advanced practical and/or instrumental techniques. The degree is therefore particularly suitable for those seeking to pursue a career as a professional research chemist, especially one in the pharmaceutical industry.

Educational Aims of the Programme

At the end of the programme, students be suitably-trained for professional employment or further study through having:
- knowledge of a wide range of chemical topics up to an advanced level;
- an understanding of basic principles of human physiology, biochemistry and drug action;
- knowledge of the drug-development process (including drug discovery and synthesis);
- advanced skills in solving problems of a chemical nature, and in the interpretation and assessment of chemical data;
- highly-advanced practical skills in the conduct of chemical reactions and experiments;
- experience in a wide range of analytical/preparative techniques, and in the undertaking of a major research-based project.

More generally, the programme aims to:
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- provide a rational and coherent programme of study which is relevant to the needs of employers, facilitates the professional development of the student and lays the foundations for a successful career to the benefit of the economy and society;
- provide a sound knowledge base in the fields studied and develop key transferable skills in the areas of communication, numeracy, information technology, team-working, problem-solving, time and task management;
- foster the development of an enquiring, open-minded and creative attitude, tempered with scientific discipline and social awareness, which encourages lifelong learning.

Learning Outcomes
The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills and other attributes in the following areas. The programme outcomes are referenced to the relevant QAA benchmark statement(s) (see above) and the Framework for Higher Education Qualifications in England, Wales and Northern Ireland (2008), and relate to the typical student. Additionally, the SEEC Credit Level Descriptors for Further and Higher Education 2003 and Queen Mary Statement of Graduate Attributes have been used as a guiding framework for curriculum design.

Knowledge and understanding of:

| A1 | Basic essential facts, fundamental concepts, principles and theories of chemistry and pharmacology. |
| A2 | Facts, concepts, principles and theories at an advanced level across a wide range of chemical topics, typically including the following areas: Organic Chemistry: including organic structures and functional groups, stereochemistry, reactions and mechanisms, molecular synthesis, biological aspects of organic chemistry. Inorganic Chemistry: including structure and bonding, chemistry of selected elements, solid-state chemistry, metal complexes and organometallics, biological and medicinal applications of inorganic chemistry. Physical Chemistry: including chemical thermodynamics and kinetics, quantum theory and molecular bonding, spectroscopic techniques, interfaces and solution chemistry. |
| A3 | Topics in pharmacology: including drug design and targets; mode of action and metabolism; pharmacokinetics; cancer chemotherapy; structure-activity relationships and methods of drug discovery. |
| A4 | Research and communication skills: including detailed knowledge on accessing, manipulating, interpreting and presenting chemical information. |

Intellectual skills - able to:

| B1 | Reason critically (including the ability to make appropriate deductions and propose hypotheses, based on the assessment of available evidence and data). |
| B2 | Integrate theory and practice, so as to evaluate and interpret chemical information and data. |
| B3 | Identify and formulate problems, and plan strategies for their solution. |
| B4 | Apply existing knowledge and principles to the solution of unfamiliar problems. |
| B5 | Analyse and evaluate/interpret the results of controlled experiments and research results. |
| B6 | Devise strategies for the retrieval and selection of relevant information from a wide range of sources. |
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Transferable skills - able to:

C1 Communicate effectively by written and/or verbal means
C2 Manage time, prioritise workloads and work to deadlines; make decisions in complex and unpredictable situations.
C3 Learn independently, using a range of learning resources
C4 Participate constructively as a member of a group/team
C5 Apply mathematical skills and problem solving skills in a wide range of theoretical and practical situations
C6 Assess the relevance, importance and reliability of the ideas of others
C7 Use IT/computer-based technology to locate information and to analyse, manipulate and present data
C8 Explain and discuss the role and impact of science in society

Practical skills - able to:

D1 Plan and conduct laboratory-based practical work (including research-led experiments) efficiently and with due regard for safety.
D2 Use a wide range of laboratory equipment, including advanced analytical instrumentation
D3 Retrieve, filter and collate chemical data from a variety of information sources
D4 Prepare scientific/technical reports (including extended dissertations) of an appropriate professional standard
D5 Use a range of scientific software and computational tools
D6 Use advanced theories and concepts to explain observed chemical phenomena
D7 Apply mathematical knowledge and skills to the solution of a wide range of problems
D8 Plan, undertake and report a bibliographically-based piece of research
D9 Assemble and deliver oral presentations on assigned topics and project work
D10 Design experiments to acquire relevant scientific data/test scientific hypotheses; propose plausible schemes for the experimental synthesis of chemical products

Teaching, Learning and Assessment Strategies

A. Knowledge and understanding

Teaching/learning methods and strategies
Acquisition of knowledge is achieved mainly through lectures and, in some cases, directed independent learning. Understanding is reinforced through a combination of tutorial workshops, problem classes and laboratory classes (depending upon the module concerned), including regular feedback on submitted work. Additional support is provided through the individual module webpages and the facilities of the QMUL Student PC Service.
Assessment
Testing of the knowledge base is generally through a combination of unseen written examinations and assessed coursework. The exact nature of the coursework varies from module to module and may include work in the form of laboratory experiment reports, essays and/or problem sheets. The coursework mark may also include a contribution from computer-based assessments and in-course tests. Specific modules (if taken) include assessed oral examinations, oral presentations and extended reports/dissertations.

B. Intellectual skills

Teaching/learning methods and strategies
Intellectual skills are developed throughout the teaching and learning programme outlined in the following section. Analysis and problem-solving skills (3-4) are developed, in particular, through problem/example classes and tutorial workshops, whilst practical classes offer the opportunity to integrate skills (2) and improve those relating to analysis and interpretation (5). Project work offers students the opportunity to demonstrate achievement in skills 1 and 6.

Assessment
Intellectual skills 1-4 are partly assessed by formal examination, but the main vehicle of assessment for all skills is coursework (especially problem sheets, practical laboratory reports and project dissertations).

C. Transferable skills

Teaching/learning methods and strategies
Transferable skills are developed in a contextual manner throughout the teaching and learning programme outlined in the following section. Specific skills are developed further in particular modules (e.g. the Project Skills for Chemists module).

Assessment
Many of the transferable skills (e.g. 1, 2, 3, 6, 7) are indirectly assessed as part of the normal assessment processes for the programme.

D. Professional practical skills

Teaching/learning methods and strategies
Chemistry practical skills (1-5) are developed in a progressive manner throughout the programme. In the lower levels attention is concentrated on the basic skills and safe working practice, while at higher levels more advanced techniques and non-prescribed exercises are introduced. Skills in the application of chemical theories and concepts (6,10) and mathematical knowledge (7) are developed by a progression of graded problem classes and tutorial exercises. Training in other skills (8, 9) is provided through the provision of primers/guidance notes. The final year practical research project is particularly important in reinforcing and extending the students' complete portfolio of professional practical skills (1-10).

Assessment
Chemistry practical skills and report-writing skills (1-5) are assessed through written laboratory reports, which include attention to quantitative accuracy. Skills 6-7 are assessed through a combination of coursework and formal written examination in a wide range of modules, whilst skills 8-10 are assessed as part of the coursework of specific modules. The assessment of the final year practical research project addresses the majority of the professional practical skills (1-10) that students are expected to acquire.

Programme Structure(s) and Requirements, Levels and Modules

Students are required to register for modules to a value of 120 credits in each academic year; this should normally consist of 60 credits in each semester.

YEAR 1
Core modules (15 credits in total):
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**CHE101** Foundations of Practical Chemistry  (15 credits, level 4, sem A+B)

**CHE100** Essential Skills for Chemists  (15 credits, level 4, sem A+B)

**CHE102** Fundamentals of Organic Chemistry  (30 credits, level 4, sem A+B)

**CHE103** Fundamentals of Physical & Inorganic Chemistry  (30 credits, level 4, sem A+B)

**CHE104** Fundamentals of Spectroscopy  (15 credits, level 4, sem A)

**SBS017** Basic Biochemistry  (15 credits, level 4, sem B)

### YEAR 2

**CHE322** Constructing Organic Molecules  (15 credits, level 5, sem A)

**CHE361** Introduction to Drug Action  (15 credits, level 5, sem A)

**SBC920** Techniques for the Biological & Chemical Sciences  (15 credits, level 5, sem A)

**SBS501** Animal Physiology  (15 credits, level 5, sem A)

**CHE312** Transition Metal Chemistry  (15 credits, level 5, sem B)

**CHE422** Chemistry of Biological Molecules  (15 credits, level 5, sem B)

**CHE461** Chemical Pharmacology  (15 credits, level 5, sem B)

**SBC510** Molecules from First Principles  (15 credits, level 5, sem B)

### YEAR 3

**SBC605** Project Skills in Chemistry  (30 credits, level 6, sem A+B)

**CHE512** Contemporary Inorganic Chemistry  (15 credits, level 6, sem A)

**CHE561** Cancer Chemotherapy  (15 credits, level 6, sem A)

**SBC601** Topics in Biological Chemistry  (15 credits, level 6, sem B)

**SBC702** Molecules and Ions at Interfaces  (15 credits, level 6, sem B)

**SBC703** Synthesis of Pharmaceutically Active Molecules  (15 credits, level 6, sem A)

* the first part of this module generally runs after the completion of second-year examinations

### YEAR 4

**CHE750** Chemistry MSci Research Project  (60 credits, level 7, sem A+B)

**CHE463** Colloidal Chemistry  (15 credits, level 7, sem A)

**CHE464** Biological, Medicinal and Inorganic Chemistry  (15 credits, level 7, sem B)

**SBC400** Drug Design and Development  (15 credits, level 7, sem B)

Plus 15 credits from the following:

**CHE701U** Organic Synthesis 1 (15 credits, level 7, sem A)

**CHE702U** Organic Synthesis 2 (15 credits, level 7, sem A)

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### Criteria for Admission to the Programme

Candidates must be able to satisfy the general admissions requirements of the University and meet the requirements for this
specific programme of study. This is usually achieved in one of the following ways (although the entry-points tariff is subject to annual review):

For direct entry to the degree programme, candidates must usually possess a minimum total of 300 points on the UCAS points tariff system, including a minimum of a grade B in 'A2' Chemistry or an equivalent qualification. Mathematics at AS-level or higher is strongly recommended.

or via

Admission to the QMUL Science and Engineering Foundation Programme (SEFP), and successful completion of the foundation year (defined by achievement of the minimum requirements for progression defined in the SEFP programme regulations, and the criteria specified in the SEFP Student Handbook for progression to this particular degree programme).

**Quality Assurance Mechanism**

Include details of: SSLC meetings, student feedback mechanisms, personal tutor arrangements, programme induction, programme review and monitoring.

Programme reviews are undertaken by the programme co-ordinator, who reports back to the Chemistry Teaching Group, and the SBCS Teaching & Learning Committee (TLC). These reviews are based on:

- reviews of individual modules.
- external examiner reports.
- feedback from (and actions initiated by) the TLC.
- requirements of professional and accrediting bodies (especially the Royal Society of Chemistry).

Committees with responsibility for monitoring and evaluating quality and standards are:

- SBCS Teaching & Learning Committee (TLC)
- Biological & Chemical Sciences Examination Board (BCSEB).
- QMUL Science Degree Examination Board (DEB).
- QMUL Quality Enhancement Committee (QEC).

Mechanisms for monitoring and improving quality of individual staff teaching

Newly appointed staff are usually expected to have a PhD level of qualification (or equivalent levels of qualification and experience), and to undertake training in academic practice in accord with the requirements of Queen Mary, University of London. For all staff, feedback on performance (and monitoring thereof) is provided by:

- module feedback questionnaires
- the staff appraisal scheme
- peer observation of teaching.

Further opportunities for staff development are provided by The Learning Institute of QMUL.

Mechanisms for gaining student feedback on the quality of teaching and their learning experience:

- SBCS Student Staff Liaison Committee
- module feedback questionnaires

Further informal feedback is obtained through contact with students in laboratory and tutorial classes, and through meetings with student advisees.

The Induction Programme for new students includes:

- briefings from senior staff on matters relating to general study
- briefings on the conduct of chemistry practicals and laboratory matters
- an introduction to Library Services

The tutoring/advising arrangements include:

- appointment of a personal tutor for each individual student for the duration of their studies
- a Senior Academic Advisor, with overall responsibility for student welfare, who is also able to provide advice in the absence of the personal tutor.
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Programme-specific Assessment Regulations (if applicable)
In the case of programmes that deviate / do not comply with the Academic Regulations further information regarding the nature of any difference and/or deviation should be stipulated in detail.

Progression Criteria

Year 1 to Year 2
105 credits passed, with a minimum overall average (across all year 1 modules) of 50%.

Year 2 to Year 3
210 credits passed, with a minimum overall average (based on a 1:2 weighting of all modules from years 1 and 2) of 55%.

Year 3 to Year 4
315 credits passed, with a minimum overall average (based on a 1:2:3 weighting of all modules from years 1, 2 and 3) of 60%.

Candidates failing to meet the progression criteria at the end of year 1 or year 2 will be subject to an enforced change of programme registration to the F154 Pharmaceutical Chemistry BSc programme.

Candidates failing to progress to the fourth year of the MSci degree will be classified for a BSc degree in Pharmaceutical Chemistry using the College S3 mean (as per the F154 programme specification).

Regulations relating to MSci Award / Classification

For those students who entered onto the programme on or after September 2008, the classification of honours for this MSci degree programme is based on the College Mark calculated using a 1:2:3:4 weighting of the Years 1-4 of the programme (as indicated in the General Academic Regulations).

Candidates entering into the fourth year but failing to meet the requirements for the award of the MSci degree, will be considered for the award of the BSc degree in Pharmaceutical Chemistry, and classified using the College S3 mean (as per the F154 programme specification).

Employers Links
Please provide details of any links with employers e.g.

· Details of advisory panels that include current or potential employers;
· Organisations that regularly employ graduates from this programme and the roles that graduates undertake.
· Student prizes donated by organisations that may offer employment to graduates from this programme.

If there are no links with employers consider the learning outcomes and transferable skills and explain how these might be used to inform employers about the qualities and skills a graduate from this programme might be expected to have.

Chemistry is often regarded as the "central science", and interfaces with physics, biology, materials science and medicine.

This four year MSci degree, which is recognised by the Royal Society of Chemistry, offers a high-level of training in theoretical aspects of chemistry, and also covers key aspects of biochemistry, physiology and pharmacology. Graduates of this MSci programme generally have significantly more experience in the conduct of advanced practical chemistry than would be the case for graduates of the corresponding BSc degree, and have experience of undertaking an extended research project. MSci graduates can therefore be expected to possess a wider range of practical skills, and a greater ability to undertake independent research studies. The degree is therefore particularly suitable for those seeking to pursue a career as a professional research chemist, especially in the pharmaceutical industry.

Some modules on the programme include special lectures by external speakers, including employees of major chemical and pharmaceutical companies.

Graduates of chemistry degree courses are generally recognised by employers as having good technical and transferable skills:
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including skills in literacy, numeracy, application of logic, problem solving, communication, IT and computation, independent and team working, and time management.

Opportunities for employment within the field of chemistry would include careers in the following areas: chemical industry; pharmaceuticals; food industry; mining, oil and gas industries; consumer products (e.g. cosmetics); analytical and forensic services; teaching and education; environmental protection.

Opportunities for employment outside the field of chemistry would include careers in the following areas: finance; commerce; civil service; law; journalism; publishing; healthcare; technical sales; information technology.

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<th>Programme Specification Approval</th>
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<td><strong>Person completing Programme Specification</strong></td>
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This map identifies where the programme learning outcomes are assessed in the core constituent modules. It provides (i) an aid to academic staff in understanding how individual modules contribute to the programme aims (ii) a checklist for quality control purposes and (iii) a means to help students monitor their own learning, personal and professional development as the programme progresses. For each core module, indicate the programme learning outcomes that they are associated with a ‘tick’ in the relevant box(es). Core modules must be passed in order to meet award regulations.

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For each core module, indicate the programme learning outcomes that they are associated with a ‘tick’ in the relevant box(es). Core modules must be passed in order to meet award regulations.
This map identifies where the programme learning outcomes are assessed in the core constituent modules. It provides (i) an aid to academic staff in understanding how individual modules contribute to the programme aims; (ii) a checklist for quality control purposes; and (iii) a means to help students monitor their own learning, personal and professional development as the programme progresses. For each core module, indicate the programme learning outcomes that they are associated with with a tick in the relevant box(es). Core modules **must** be passed in order to meet award regulations.

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<tr>
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**Key**

A Learning Outcome which is assessed as part of the module is denoted by a 'tick' in the above table.

**K & U** = Knowledge & Understanding  
**I Skills** = Intellectual Skills  
**T Skills** - Transferable Skills  
**P Skills** = Practical Skills