Programme Title: Chemistry with Biochemistry

Programme Specification

Awarding Body/Institution: Queen Mary, University of London
Teaching Institution: Queen Mary, University of London
Name of Final Award and Programme Title: BSc Chemistry with Biochemistry
Duration of Study / Period of Registration: 3 years
QM Programme Code / UCAS Code(s): UBSF-QMCHEM1/UMCHEBCH (F1C7)
QAA Benchmark Group: Chemistry
FHEQ Level of Award: Level 6
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 programme aims to provide a comprehensive training in the field of chemistry with an introduction to key principles of biochemistry, in particular, molecular concepts of complex biological systems. Students following this program will therefore learn about important chemical principles and their relationship to biological systems.

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;
• skills in solving problems of a chemical nature, and in the interpretation and assessment of chemical data;
• advanced practical skills in the conduct of chemical reactions/experiments and in a range of analytical/preparative techniques;
• an understanding of the basic principles of biochemistry

More generally, the programme aims to:
• 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;
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- 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. |
| 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, applications of inorganic chemistry. Physical Chemistry: including chemical thermodynamics and kinetics, quantum theory and molecular bonding, spectroscopic techniques, interfaces and solution chemistry. |
| A3 | Concepts in basic biochemistry and genetics, and (subject to the choice of electives) enzyme kinetics, animal physiology, endocrine physiology, metabolic processes, protein structures and bioinformatics. |

Intellectual skills - able to:

| B1 | Reason critically |
| B2 | Integrate theory and practice |
| B3 | Identify and formulate problems |
| B4 | Apply principles to the solution of problems |
| B5 | Analyse and evaluate/interpret the results of controlled experiments |
| B6 | Devise strategies for the retrieval and selection of relevant information from a wide range of sources |

Transferable skills - able to:

| C1 | Communicate effectively by written and/or verbal means |
| C2 | Manage time, prioritise workloads and work to deadlines |
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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, efficiently and with due regard for safety
D2 Use a wide range of laboratory and analytical equipment
D3 Retrieve, filter and collate chemical data from a variety of information sources
D4 Prepare scientific/technical reports of an appropriate professional standard
D5 Use a range of scientific software and computational tools
D6 Use advanced theories and concepts to explain 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

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) 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.

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. Skills 8,9 are assessed as part of the coursework of specific modules.

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):
CHE101 Foundations of Practical Chemistry (15 credits, level 4, sem A+B)

Compulsory modules (105 credits in total):
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)
SBS008 Heredity and Gene Action (15 credits, level 4, sem A)
SBS017 Basic Biochemistry (15 credits, level 4, sem B)

YEAR 2

Compulsory modules (90 credits in total):
CHE322 Constructing Organic Molecules (15 credits, level 5, sem A)
SBC920 Techniques for the Biological & Chemical Sciences (15 credits, level 5, sem A)
SBS908 Membrane Biochemistry (15 credits, level 5, sem A)
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CHE422 Chemistry of Biological Molecules (15 credits, level 5, sem B)
CHE312 Transition Metal Chemistry (15 credits, level 5, sem B)
SBC510 Molecules from First Principles (15 credits, level 5, sem B)

Plus 30 credits from the following:
SBS501 Animal Physiology (15 credits, level 5, sem A)
SBS642 Genes and Bioinformatics (15 credits, level 5, sem B)
SBS905 Metabolic Pathways (15 credits, level 5, sem B)

YEAR 3
Compulsory modules (75 credits in total):
CHE010 Advanced Experimental Chemistry (15 credits, level 6, sem A)*
CHE512 Contemporary Inorganic Chemistry (15 credits, level 6, sem A)
SBC703 Synthesis of Pharmaceutically Active Molecules (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)

Plus 30 credits from the following:
SBC605 Project Skills in Chemistry (30 credits, level 6, sem A+B)
CHE900 Chemistry Project (30 credits, level 6, sem A+B)**
SBS___ Biological Sciences Research Project (30 credits, level 6, sem A+B)**

Plus 15 credits from the following:
SBS517 Endocrine Physiology and Biochemistry (15 credits, level 6, sem A)
SBS922 Membrane Proteins (15 credits, level 6, sem A)
SBS929 Molecular Basis of Disease (15 credits, level 6, sem A)
SBC709 Functional Genomics and Epigenetics (15 credits, level 6, sem B)
SBS920 Enzyme Catalysis (15 credits, level 6, sem B)
SBC351 Protein Structure, Folding and Assemblies (15 credits, level 6, sem B)

* the first part of this module generally runs after the completion of second-year examinations
** subject to students meeting the minimum academic conditions for registration for this module

### 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).
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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.
- 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.

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.
**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 three year degree, which is recognised by the Royal Society of Chemistry, offers a high-level of training in both practical and theoretical aspects of chemistry, suitable for those wishing to pursue a career as a professional chemist. Graduates of the programme also possess knowledge of key aspects of biochemistry, which will be of use to those aiming to pursue careers working at the interface of chemistry with molecular biology.

Graduates of chemistry degree courses are generally recognised by employers as having good technical and transferable skills: 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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**Programme Specification Approval**

| Person completing Programme Specification | Dr R M Nix |
| Person responsible for management of programme | Dr M Resmini |
| Date Programme Specification produced/amended by School or teaching and learning committee | 16 Apr 2012 |
| Date Programme Specification approved by Programme and Module approval Board | 22 May 2012 |
Table 1: Development of Programme Learning Outcomes in the Core Constituent Modules

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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Title of Core Module: Foundations of Practical Chemistry
Module Code: CHE101
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<table>
<thead>
<tr>
<th>Title of Core Module</th>
<th>Module Code</th>
</tr>
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<tbody>
<tr>
<td>Foundations of Practical Chemistry</td>
<td>CHE101</td>
</tr>
</tbody>
</table>
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