

**MChem Chemistry with Analytical Sciences (4 year Sandwich) UCAS code: F183**  
**For students entering Part 1 in 2004**

|  |                            |
|--|----------------------------|
| Awarding Institution:  | The University of Reading  |
| Teaching Institution:  | The University of Reading  |
| Relevant QAA subject benchmarking group(s):                                    | Chemistry                  |
| Faculty of Science   | Programme length: 4 years  |
| Date of Specification: Mar 2007  |                            |
| Programme Director:  | Dr MJ Almond               |
| Programme Advisers:  | Dr MJ Almond*              |
| Board of Studies:  | Chemistry                  |
| Accreditation:   | Royal Society of Chemistry |
| • Dr J E McKendrick will act as programme adviser during the year in industry. |                            |

**Summary of programme aims and learning outcomes**

The programme aims to provide a thorough degree-level education in Chemistry with specific regard to analytical sciences. For a full statement of the programme aims and learning outcomes, see below.

**Transferable skills**

The University's Strategy for Teaching and Learning has identified a number of generic transferable skills that all students are expected to have developed by the end of their degree programme. In following this programme, students will have had the opportunity to enhance their skills relating to career management, communication (both oral and written), information handling, numeracy, problem solving, team-working and the use of information technology.

As part of this programme, students are expected to have gained experience and show competence in the following transferable skills: analytical methods, problem-solving, IT (word-processing, use of standard and mathematical software), scientific writing, oral presentation, team-working, time-management, use of library resources, career planning and management and business awareness.

**Programme content**

The course profile that follows states which modules must be taken (the compulsory part), together with one or more lists of modules from which the student must make a selection (the 'optional' modules). Students must choose an appropriate number of optional modules, in consultation with their programme adviser, in order to make 120 credits in each Part (the optional modules available in Part 1 are detailed in the supplementary material). The number of module credits for each module is shown adjacent to its title.

**Part 1 (2004-2005)(three terms)**

| <i>Compulsory modules</i> | <i>Title</i>                               | <i>Credits</i> | <i>Level</i> |
|---------------------------|--|----------------|--------------|
| CH1I1                     | <i>Introduction to Inorganic Chemistry</i> | 20             | C            |
| CH1O1                     | <i>Introduction to Organic Chemistry</i>   | 20             | C            |
| CH1P1                     | <i>Introduction to Physical Chemistry</i>  | 20             | C            |
| CH1SK1                    | <i>Skills for Chemists</i>                 | 10             | C            |
| <b><i>Either</i></b>      |  |                |              |
| BI1C10                    | <i>Cell Biology and Biochemistry</i>       | 10             | C            |
| BI1C11                    | <i>Genetics and Molecular Biology</i>      | 10             | C            |
| <b><i>or</i></b>          |  |                |              |
| AM1M11                    | <i>Microbiology 1</i>                      | 10             | C            |
| AM1M12                    | <i>Microbiology 2</i>                      | 10             | C            |

The following module is **compulsory** for students who do not have an A-level pass in Mathematics.

|       |                                    |    |   |
|-------|------------------------------------|----|---|
| CH1M1 | <i>Mathematics for Chemistry 1</i> | 20 | C |
|-------|------------------------------------|----|---|

The following module is **compulsory** for students who have an A-level pass at grade C-E in Mathematics and **optional** for those with a grade A-B.

|       |                                    |    |   |
|-------|------------------------------------|----|---|
| CH1M2 | <i>Mathematics for Chemistry 2</i> | 10 | C |
|-------|------------------------------------|----|---|

#### Optional modules

Students will select modules amounting to 10 credits (if they take CH1M) or 20 credits (if they take CH1M2) from outside the School of Chemistry.

#### Part 2 (three terms) (2005-2006)

##### Compulsory Modules (120 credits)

|        |   |    |   |
|--------|---|----|---|
| CH2I1  | <i>Inorganic Chemistry 2</i>                            | 20 | I |
| CH2O1  | <i>Organic Chemistry 2</i>                              | 20 | I |
| CH2P1  | <i>Physical Chemistry 2</i>                             | 20 | I |
| CH2A1  | <i>Analytical Chemistry &amp; Professional Skills 1</i> | 20 | I |
| CH2AA  | <i>Advanced Analytical Chemistry 2</i>                  | 20 | I |
| CH2FA1 | <i>Forensic Analysis 1</i>                              | 10 | I |
| GO2P5  | <i>Crime Scene Analysis</i>                             | 10 | I |

#### Part 3 (2006-2007) (three terms): Year in Industry

| <i>Compulsory modules</i> | <i>Title</i>            | <i>Credits</i> | <i>Level</i> |
|---------------------------|-------------------------|----------------|--------------|
| CH3IN                     | <i>Year in Industry</i> | 120            | H            |

#### Part 4 (three terms) (2007-2008)

##### Compulsory modules (120 credits)

|       |   | <i>Credits</i> | <i>Level</i> |
|-------|---|----------------|--------------|
| CH4SK | <i>Chemistry in Industry and Professional Skills</i>    | 10             | M            |
| CH3A1 | <i>Analytical Chemistry 2</i>                           | 20             | H            |
| CH4I1 | <i>Structure Determination</i>                          | 10             | M            |
| CH4O1 | <i>Advanced Organic Chemistry-Synthetic Methodology</i> | 10             | M            |
| CH4P1 | <i>Lasers, Photochemistry and the Atmosphere</i>        | 10             | M            |
| CH4PR | <i>Research Project</i>                                 | 60             | M            |

#### Progression requirements

##### Progression from Part 1 to Part 2:

To gain a threshold performance at Part 1 a student shall normally be required to achieve an overall average of 40% over 120 credits taken in Part 1, and a mark of at least 30% in individual modules amounting to not less than 100 credits. In order to progress from Part 1 to Part 2, a student shall normally be required to achieve a threshold performance at Part 1, **and**

not less than 40% in the compulsory core modules (CH1I1, CH1O1 and CH1P1) averaged together **and**

not less than 40% in the practical chemistry components of the core modules averaged together.

##### Progression from Part 2 to Part 3

To gain a threshold performance at Part 2 a student shall normally be required to achieve an overall average of 40% over 120 credits taken in Part 2, and a mark of at least 30% in individual modules amounting to not less than 100 credits. In order to progress from Part 2 to Part 3, a student shall normally be required to achieve a threshold performance at Part 2 and achieve an overall average of 50% over 120 credits taken in Part 2 (of which not less than 100 credits should normally be at I level or above) , **and**

not less than 50% in the compulsory core modules (CH2I1, CH2O1, CH2P1, CH2A1) averaged together, **and**  
not less than 40% in the practical chemistry components of the core chemistry modules averaged together.

A pass of at least 40% in module CH4PR is required to qualify for an honours degree.

(Marks of between 40-49% are sufficient for transfer to a BSc degree)

### **Summary of teaching and assessment**

Teaching is organised in modules that incorporate a balance of lectures, tutorials, workshops and practical laboratory classes. Modules in Part 1 and 2 are assessed by a mixture of coursework and formal written examination. In Part 3 and Part 4, modules are either assessed wholly by coursework or by a mixture of coursework and formal written examination – details are provided in the module descriptions.

Part 2 contributes 20% and Part 3 contributes 40% and Part 4 contributes 50% towards Final Degree classification.

To be eligible for Honours, students must normally pass H Level modules with a total credit of at least 80 in Chemistry. The degree awarded will be in accord with the University of Reading degree classification as detailed below:

| <b>Mark / %</b> | <b>Degree Classification</b> |
|-----------------|------------------------------|
| 70-100          | First Class                  |
| 60-69           | Upper Second Class           |
| 50-59           | Lower Second Class           |
| 40-49           | Third Class                  |
| 35-39           | Below Honours Standard       |
| 0-34            | Fail                         |

### **Admission requirements**

Entrants to this programme are normally required to have obtained:

Grade C or better in English at GCSE level; and achieved

UCAS Tariff:

300 points from 3 A levels (with B in Chemistry at A2 level) or 280 points from 3 A levels and 1 AS level

International Baccalaureat: 30 points including 6 in Higher Chemistry; or

Irish Leaving Certificate: Grade B in Chemistry and three Bs and a C in four other subjects

Two AS grades are accepted in place of one A-level

BTEC Higher or National Certificate or Diploma with three merits in appropriate subjects.

Advanced GNVQ Science Merit with some additional mathematics.

Admissions Tutor: Dr J M Elliott

email : j.m.elliott@rdg.ac.uk

### **Support for students and their learning**

University support for students and their learning falls into two main categories. Learning support includes IT Services, which has several hundred computers and the University Library, which across its three sites holds over a million volumes, subscribes to around 4000 current periodicals, has a range of electronic sources of information and houses the Student Access to Independent Learning (S@IL) computer-based teaching and learning facilities. There are language laboratory facilities both for those students studying on a language degree and for those taking modules offered by the Institution-wide Language Programme. Student guidance and welfare support is provided by Personal Tutors, the Careers Advisory Service, the University's Special Needs Advisors, Hall Wardens and the Students' Union.

Within the providing Schools, additional support is given through practical classes in both Chemistry and Analytical Methods. The development of key analytical and problem-solving

skills is assisted by extensive practice in practical laboratory classes and by the provision of structured workshop/tutorial problem sessions. A dedicated analytical laboratory has been created in the School of Chemistry in 2001 that features a comprehensive range of modern instrumentation that is prerequisite for courses of this type in order to provide the necessary 'hands-on' experience to the undergraduate students. There are Directors of Undergraduate Studies who are available to offer advice on the choice of modules within the programme. During the industrial placement year, support is provided by the assigned supervisor in the company in which the placement is being carried out and on an academic basis, from the School of Chemistry in the form of an assigned tutor and the industrial placement tutor, Dr J E McKendrick.

### **Career prospects**

The need for biochemical, chemical and physical analysis spans across numerous fields and consequently there is always a high demand for skilled, well-trained Chemists with specialist skills in analytical science. Analytical chemists therefore find employed in a diverse range of situations: to solve an environmental issue, provide routine water quality analysis, determine the purity of a drug or to help investigate an athlete who is suspected of using illegal performance enhancing drugs.

However, the employment prospects are not only limited to chemistry-based careers – as consequence of the numeracy and report-writing skills developed in this course and exposure to the legal aspects of chemical analysis, graduates with a degree in Chemistry with Analytical Sciences will be employable in vocations such as accountancy and law.

### **Opportunities for study abroad or for placements**

The programme has been designed with the specific aim of incorporating a one-year industrial placement into it. An industrial placement is a key factor to a degree programme of this type and will enhance the skill base and employment prospects of the undergraduates taking part. The 'value-added' factor received from an industrial placement is enormous. The Department of Chemistry has numerous contacts with a wide range of industries who are keen to place Reading Chemistry undergraduates within their laboratories and is thus well placed to run courses of this nature. A member of staff, Dr J E McKendrick, is the industrial placement tutor and acts as the liaison and co-ordinator between the School of Chemistry and the various industrial companies involved with this programme.

There may be limited opportunities for students to take their industrial placement in Europe but this will depend on their having the necessary linguistic skills as well as finding a suitable placement.

### **Educational aims of the programme**

The programme aims to provide a thorough degree-level education in Chemistry with particular emphasis on analytical science. The primary objective is to produce competent well-rounded chemists first and foremost, but who are also able to carry out a variety of modern analytical techniques and consequently able to:

- Assess/evaluate an analytical problem
- Develop appropriate analytical methodologies
- Accurately record/measure data;
- Analyse and evaluate the results obtained;
- Report the data in an appropriate form and critically assess the results obtained.

## Programme outcomes

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

### *Knowledge and Understanding*

#### **A. Knowledge and understanding of:**

1. the fundamental concepts and techniques of chemistry
2. a selection of more specialist topics in the three main branches of the subject and in analytical chemistry
3. the main techniques involved in practical work
4. the spectroscopic methods used to identify molecules and to determine their structure and the basics of the underlying theory.

#### **Teaching/learning methods and strategies**

The knowledge required for the basic topics is provided in formal lectures supported by problem sets for students to tackle on their own and which are discussed formally in tutorial sessions with members of staff.

2 is addressed particularly during Part 4 of the course.

Practical classes are held throughout Parts 1 & 2 3 in which students develop their skills prior to applying them in their Part 4 project.

Feedback on student work is provided by the discussion and return of work in tutorials and by regular workshop sessions during which students tackle unseen problems in the presence of academic staff who provide support.

All practical work is marked and returned to the student.

#### *Assessment*

Most knowledge is tested through a combination of coursework and unseen formal examinations, although 3 is assessed by coursework. Dissertations and oral presentations also contribute to assessment, particularly in Part 4.

### *Skills and other Attributes*

#### **B. Intellectual skills – able to:**

1. think logically
2. analyse and solve problems
3. organise tasks into a structured form
4. understand the evolving state of knowledge in a rapidly developing area
5. transfer appropriate knowledge and methods from one topic within the subject to another
6. plan, conduct and write a report on an independent project
7. construct a poster
8. work in an industrial environment.

#### **Teaching/learning methods and strategies**

Logic is an essential part of the understanding and construction of synthetic methods and mechanistic pathways that are the frameworks for much organic and inorganic chemistry.

While not exclusively the preserve of physical chemistry, problem solving plays a major part in this section of the course.

Latest developments in the subject are introduced where appropriate, particularly in Part 4.

Practical reports in Part 1 & 2 provide training for the Part 3 & 4 project reports.

#### *Assessment*

1-4 are assessed directly and indirectly in most parts of this chemistry course, while 5 contributes to the most successful work.

6 & 7 are assessed in the Part 3 & 4 project reports.

**C. Practical skills – able to:**

1. follow practical instructions safely and accurately
2. carry out a variety of experimental procedures
3. measure and interpret various spectroscopic techniques
4. interpret quantitatively the results of their experiments
5. formulate safety protocols
6. devise suitable experimental methods for tackling a particular problem

**Teaching/learning methods and strategies**

Detailed practical manuals are provided for all practical courses in Parts 1 & 2, together with sources of recommended further reading. Staff and post-graduate demonstrators are present during every practical session to guide and help students and to mark their reports.

Workshop sessions are held to assist students in interpreting spectroscopic information obtained on unknown compounds.

In Part 4 students work on individual projects under the supervision of one or more members of staff.

*Assessment*

1 to 4 are tested to different extents by the practical work associated with Parts 1 - 3 of the chemistry course.

3 is assessed through problems set in written examinations.

5 is specifically assessed during the organic practical course in Part 2, although safe working procedures are emphasised at every stage.

3 is specifically but not exclusively assessed within core modules CH2A1 and CH2AA1.

6 is assessed in the Part 4 project and during the placement in Industry.

**D. Transferable skills – able to:**

1. use IT (word-processing, spreadsheets and chemical databases)
2. communicate scientific ideas
3. give oral presentations
4. work as part of a team
5. use library resources
6. manage time
7. plan their career.

**Teaching/learning methods and strategies**

The use of IT is embedded throughout the programme but is specifically addressed in the core module CH1SK1.

Team-work and career planning are both part of module CH2A1 and the former is taught in practical classes in Part 2. Oral presentations are associated with module CH3A1 and CH4PR.

Library resources are specifically addressed through a small project in module CH3A1, and within the fourth year project.

Time management is essential for the timely and effective completion of the programme

*Assessment*

1 - 5 contribute assessed coursework within the two compulsory modules on analytical and professional skills, CH2A1 and CH3A1.

Career planning is assessed through the 5 credit CMS course embedded within module CH2A1.

**Please note - This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each module can be found in the module description and in the programme handbook. The University reserves the right to modify this specification in unforeseen circumstances, or where the process of academic development and feedback from students, quality assurance processes or external sources, such as professional bodies, requires a change to be made. In such circumstances, a revised specification will be issued.**