4-Year 'New Route' PhD in Chemistry
For students entering PhD programme in 2007

Awarding Institution:	University of Reading
Teaching Institution:	University of Reading
Faculty of Life Sciences	Programme length: 48 months
Date of specification: January 2007	
Programme Director:	Dr. W.C. Hayes
Board of Studies:	Chemistry

Summary of programme aims

This programme aims to provide a flexible course that enables students to acquire specialist research techniques and expertise in their chosen area of Chemistry. The ultimate aim of the programme is to fully prepare students for a career in Research and Development as professional chemists. Students will be trained to undertake practical and theoretical research in their specialist area of chemistry with guidance from an experienced researcher. This necessitates that all students will be able to establish the extent of published knowledge in the chosen field, understand and summarise that knowledge and be able to report formally, both via oral and written means. In addition, all students will be provided with a solid theoretical grounding of important concepts associated with their chosen research area and training in relevant database searching skills will be provided.

Transferable skills

A number of generic transferable skills will be acquired during this programme and these will be taught via formal courses as well as day-to-day training. In following this programme, students will have the opportunity to develop their skills relating to organisation and time management, project design and management, communication (both written and oral), information handling, database searching, numeracy, problem solving and team working. A major focus of the programme will be on practical methods and the development and perfection of research methods and skills, self-motivation skills and the ability to work independently or as a team member will be expected at the end of the programme.

Programme content

This 4-year 'New Route' PhD Chemistry degree combines taught modules with a research project module. The programme is divided into two stages. In *Stage One*, students follow modules on Research Methods and Skills plus taught modules relevant to the research project module (these modules are selected jointly by the student and supervisor in conjunction with the programme director). If appropriate, modules from other Schools may be selected, subject to agreement of all parties. A summary of the structure of *Stage One* of the programme is provided below.

Stage One
- Research Methods (30 credits)
- Project Management (30 credits)
- Project Planning (30 credits)
- Chemistry Taught Modules (2×20 credits) Students will take relevant modules totalling 40 credits at H or M level from existing programmes within the School of Chemistry or, where appropriate, from other Schools/Departments.
- Literature Review (50 credits)
  The literature review will normally be linked to the intended focus of the thesis of the research project except where special circumstances, such as employer requirements or a substantial lapse of time between the two, make this undesirable.

Stage Two
- Research Project (500 credits)
- Career and Professional Development Module (40 credits)
  This module will include key assessments in Year 3 and 4 in the form of presentations given at the School of Chemistry's 'Research Day. The presentation in Year 3 will be a poster whilst in Year 4 an oral presentation to the Research School will be given. Training will be provided by the Director of Postgraduate Studies in the School of Chemistry on these presentation methods and both the poster and oral presentation will be subject to assessment from a board of external assessors appointed by the Director of Research in the School of Chemistry.

Progression requirements
The successful completion of all modules in Stage One will be required before formal permission to start Stage Two is given. Appointed examiners (an internal and external examiner) will approve progression onto Stage Two of the programme. In order to be awarded the PhD degree, the candidate must pass all modules. If a student fails a module, then he/she will be re-examined within the course schedule. If, at the end of *Stage One*, a student has not achieved a pass in all modules, they are eligible for a Postgraduate Diploma providing they have obtained an average mark of 50 % in 120 credits and have marks lower than 40 % in no more than 30 of those credits. In the event that the student is not eligible for the PhD degree via the assessments of project reports during *Stage Two*, the student may, at the discretion of the examiners, be awarded an MPhil degree if the research work is of appropriate quality at the end of Year II of the programme.

Summary of teaching and assessment
All of the modules will be assessed. Taught modules will be normally be assessed by a mixture of examination and continual assessment. Candidates must achieve an overall average mark of 50% or better in the taught modules. In cases of failure there will be a resit examination, within the course schedule.

The remainder of the course assessment will come from the written dissertation and *viva voce* exam, which will be based on the research project. Each candidate will be appointed two academic supervisors from the School of Chemistry (or alternatively in the case of collaborative inter-departmental/school projects, one supervisor from Chemistry and one supervisor from the other participating department/school). The primary roles of the supervisory 'team' is to ensure that the candidate receives the appropriate training and guidance during the research project and are thus prepared in a appropriate manner for their *viva voce* exam. Progress during Stage Two will be monitored via a series of reports and short (30 minute – 1 hour long) *viva voce* exams (conducted by an appointed internal examiner and the two academic supervisors) at the end of each academic year in addition to the presentations given by the candidate in Year 3 and 4 at the School of Chemistry 'Research Day'. Each candidate will be examined by an approved external examiner, selected for both his/her expertise in the subject and experience in examining. As with other (research) higher degrees a suitable internal examiner will also be appointed. A *viva voce* will be arranged which will examine the material of the dissertation.

Admission requirements
Entrants to this programme are normally required to have obtained a degree at the equivalent of UK 2.1 (Hons) or better in Chemistry or a closely related programme. However, given the interdisciplinary nature of the subject area, motivated applicants with other degree backgrounds are also strongly encouraged to apply.

Admissions tutor: Prof. D.J. Cardin   E-mail : d.j.cardin@rdg.ac.uk

Support for students and their learning
University support for students and their learning falls into two categories. Learning support includes IT services, which has several hundred computers, the University Library, which across its three sites holds over a million volumes, subscribes to around 4,000 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 and the training course in generic research methods provided by the Joint Faculties of Science and Life Sciences. 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. All foreign students undertaking this degree programme will be registered on in-sessional English support classes courses organised and delivered by the Centre for Applied Language Studies on campus in order to improve their written and spoken English. Student guidance and welfare support is provided by Programme Directors, the Careers Advisory Service, the University's Special Needs Advisor, Study Advisors, Hall Wardens and the Students' Union.

School support is provided through the project supervisor and an internal assessor, the course administrator, and the Director of Postgraduate Studies, all of whom are actively involved in the running of the course. Each student will be assigned a supervisor with expertise in the subject area of the student's dissertation project. It is the responsibility of this research supervisor to give guidance to the student through regular meetings. Students are provided with Student Logbooks in which academic and professional progress can be registered and monitored. Candidates will self-assess their own academic and professional progress during this programme by completing this Student Logbook during the research programme in they record key skills acquired during their studies. This Logbook will be discussed with the candidate's two academic supervisors at regular meetings and will provide the focus for direction of the professional development of the candidate during the period of study. For full-time students these meeting should take place at least once every three weeks. It is the responsibility of the student to raise with the supervisor any difficulties or problems which occur in the course of the work and to submit coursework and progress reports as required by the course handbook. The choice of taught courses to be taken should be made by the student in consultation with the supervisor and must be validated by the Director of Postgraduate Studies. Tutorials and problem classes are held for the taught elements of the course. A progress report on the research project after six months is a requirement. This report is read by the Internal Assessor who provides feedback. A detailed course handbook is also available and students are able to report back comments on the course via the Staff Student Committee.

Career prospects
This programme is attractive to graduates who wish to obtain additional research experience before seeking employment. Graduates from this programme will be well qualified to obtain employment in research and development. Alternatively, graduates will have the necessary numerical and transferable skills to allow them to move into a range of more general career choices such as accounting or computing.

Opportunities for study abroad or in industry
The nature of the course does not provide scope for spending time abroad or in industry but during *Stage Two* of the programme students will be encouraged to attend national or international conferences.

Educational aims of the programme
The aims of the programme are to increase the knowledge and understanding of students on the programme about chemistry and other relevant issues in their roles as professional chemists. In particular, this high level programme aims to examine and generate developments at the cutting edge of current knowledge in the field. It aims to equip students on the programme with the appropriate skills base with which to evaluate research findings and to conduct original research.

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:	**Teaching/learning methods and strategies**
1. The chosen research area of Chemistry 2. Scientific advances related to the research area 3. Specialist research techniques	1 and 2. Knowledge of the chosen research area and related areas will be acquired by attending formal lectures and problem classes from the agreed modular programme, as well as attending colloquia and conferences related to the subject area. Researching and reading primary journals during the programme will provide theoretical knowledge of the chosen area. 3. Hands on practical experience will be gained during the research project and training in specialist research techniques will be provided by the supervisor, technicians and senior members of the research group. Feedback on the student's progress will be provided via formal meetings with the supervisor, and discussions on taught work during tutorials as well as by the Internal Assessor from assessment of interim reports. *Assessment* The knowledge and understanding that has been acquired will be assessed via exams and continual assessment in *Stage One*, the written reports and thesis and the *viva voce* exam.

Skills and other attributes

B. Intellectual Skills – be able to:	**Teaching / learning methods and strategies**
1. think logically 2. analyse and solve problems 3. organise and plan tasks into a structured form 4. understand the evolving state of knowledge within the chosen research area 5. plan, conduct and write a report on the chosen research topic.	1. Logic is an essential part of the PhD programme and will be involved in the problem solving elements of the taught courses and the conduct of the research project. 2. The analysis of problems will be central to all parts of the course and students will gain experience in this area by solving theoretical problems in lectures, tutorials and problem classes, and overcoming experimental problems that may occur during the research project. 3. The efficient running of the research project will require the development of effective organisation and planning skills. Guidance in this area will be provided by the supervisor and via attendance of lectures covering time and resource management. 4. The student will be required to review the current state of knowledge within their chosen research area as part of their literature review module (*Stage One*) and thesis (*Stage Two*). Guidance in this area will be provided by the research supervisor. 5. The supervisors and senior members of the research group will provide guidance in planning, conducting and writing a report of the chosen research area. Guidance in writing reports will be provided by attending lectures on communication skills. *Assessment* All points will be assessed through the assessments and exams relating to the taught modules as well as via the dissertation and viva voce exam.

C.	**Practical Skills – be able to**	**Teaching / learning methods and strategies**

C.   Practical Skills – be able to

1. follow practical instructions safely and accurately
2. formulate safety protocols
3. carry out a variety of experimental procedures
4. measure and interpret various spectroscopic techniques
5. interpret quantitatively the results of their experiments
6. devise suitable experimental methods for tackling a particular problem
7. Access a wide range of literature and data using bibliographic and IT skills
8. Use IT for data handling and analysis
9. Communicate to different audiences

Teaching / learning methods and strategies

1, 2 and 3.   Practical instruction in conducting experimental research and formulating safety protocols will be provided by the supervisor(s), senior research group members and technicians. Attendance of lectures covering ethical and legal issues of research will also be of use.

4 and 5. All research projects selected in *Stage Two* will necessitate the measurement and interpretation of a range of spectroscopic data such as infra red, nuclear magnetic resonance and ultra violet spectra. All projects will produce data that must be analysed and interpreted in a qualitative and quantitative fashion before further experiments can be designed. In the first instance training in data analysis will be provided by the research supervisor and senior members of the research group.

As research progresses within *Stage Two* the student will have the opportunity to devise new experiments for obtaining novel data or preparing novel intermediates. At the onset of *Stage Two* experiments will be designed in collaboration with the research supervisor. Discussions held during the planning of such experiments will serve to train the student to think independently and devise new experiments that will provide meaningful results for the project

Assessment
    Assessment will mainly be via the dissertation and viva voce exam relating to *Stage Two*.

D. Transferable skills – be able to:	**Teaching / learning methods and strategies**
1. perform research with efficient planning and time management 2. use IT (word-processing, spreadsheets and chemical databases) 3. prepare and deliver written and oral reports 4. ability to work in a team or as an individual 5. solve problems 6. make decisions	1. *Stages One* and *Two* will provide training in time and resource management and day-to-day training will be provided by the supervisor during *Stage Two*. 2. Specific training in IT will be provided through training programmes organised by the library as well as lectures. Training on searching chemical databases such as Beilstein, Web of Science and Scifinder Scholar will also be provided by the research supervisor and senior members of the research group. Training to familiarise students with specific chemical drawing packages such as ChemDraw will also be provided by the supervisor and senior members of the research group. 3. Attendance of the lectures on communication skills within *Stage One* as well as guidance from the research supervisor and senior members of the research group during *Stage Two* will assist with training in this area. 4. The ability to work in a team or as an individual will be covered both during the lectures on interpersonal skills. 5. Training in problem solving will be provided through lectures and tutorials, as well as through discussions with the research supervisor of problems encountered in *Stage Two*. 6. During *Stage Two* the student will gradually be given the opportunity to work independently on the chosen research area. This will allow them to make decisions as to which experiments should be performed, and how experiments should be conducted. 7. Foreign students will be registered on in-session English support classes *Assessment* Assessment will mainly be via the dissertation and viva voce exam relating to *Stage Two*.

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.