1. **Title of the module**

CHEM6230 (CH623) - Main Group and Organometallic Chemistry

1. **School or partner institution which will be responsible for management of the module**

Physical Sciences

1. **The level of the module (Level 4, Level 5, Level 6 or Level 7)**

Level 6

1. **The number of credits and the ECTS value which the module represents**

15 credits (7.5 ECTS)

1. **Which term(s) the module is to be taught in (or other teaching pattern)**

Autumn and Spring

1. **Prerequisite and co-requisite modules**

Prerequisite:

Completion of Stage 2 of the following programmes:

BSc Chemistry

MSc Chemistry

Chemistry with a Year in Industry

1. **The programmes of study to which the module contributes**

BSc Chemistry

MSci Chemistry

MSci Chemistry with a Year in Industry

1. **The intended subject specific learning outcomes.
On successfully completing the module students will be able to:**

Have a knowledge and understanding of:

8.1 Core and foundation scientific chemical, physical and biological concepts, terminology, theory, units, conventions, and laboratory practice and methods in relation to the chemical sciences.

8.2 Areas of chemistry including properties of chemical elements, states of matter, organic functional groups, physiochemical principles, organic and inorganic materials, synthetic pathways, analytical chemistry, drug chemistry, biochemistry, fires and explosions.

8.3 Appreciate developments at the forefront of some areas of chemical sciences.

Intellectual skills:

8.4 Ability to demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to the subject and to apply such knowledge and understanding to the solution of qualitative and quantitative problems.

8.5 Ability to recognise and analyse problems and plan strategies for their solution by the evaluation, interpretation and synthesis of scientific information and data.

Subject-specific skills:

8.6 Skills in the safe handling of chemical materials, taking into account their physical and chemical properties, including any specific hazards associated with their use and to risk assess such hazards. Concepts in NMR (paramagnetic NMR, quadrupolar NMR, Variable temperature NMR).

8.7 Skills required for carrying out documented standard laboratory procedures involved in synthetic and analytical work in relation to organic and inorganic systems. Skills in observational and instrumental monitoring of physiochemical events and changes. The systematic and reliable documentation of the above. Operation of standard analytical instruments employed in the chemical sciences. Synthetic techniques and reaction conditions for common organometallic syntheses. Synthetic techniques and reaction conditions for main group compounds. Identifying Lewis acidic and Lewis basic sites within molecules.

8.8 The ability to collate, interpret and explain the significance and underlying theory of experimental data, including an assessment of limits of accuracy. Ability to make use of appropriate texts, or other learning resources as part of managing their own learning.

1. **The intended generic learning outcomes.
On successfully completing the module students will be able to:**

Have a knowledge and understanding of:

* 1. Communication skills, covering both written and oral communication.
	2. Generic skills needed for students to undertake further training of a professional nature.
	3. Problem-solving skills, relating to qualitative and quantitative information, extending to situations where evaluations have to be made on the basis of limited information.
	4. Numeracy and computational skills, including such aspects as error analysis, order-of-magnitude estimations, correct use of units and modes of data presentation.
	5. Interpersonal skills, relating to the ability to interact with other people and to engage in team working within a professional environment.
	6. Time-management and organisational skills, as evidenced by the ability to plan and implement efficient and effective modes of working. Self-management and organisational skills with the capacity to support life-long learning.
1. **A synopsis of the curriculum**

The nature of chemical bonding changes as you move across and down the periodic table. In this module, you will study how and why this bonding changes and how we can use our understanding of this to understand the structure and reactivity of many classes of compounds. This is coupled to advanced analytical techniques for probing these often complex and flexible structures. The concepts developed then feed into the reactivities underpinning modern Organometallic catalysis, moving from pure fundamentals to application and showing how they let us understand the cutting edge of modern research and industrial syntheses.

1. **Reading list (Indicative list, current at time of publication. Reading lists will be published annually)**

Core texts:

* Periodicity and the S- and P-block Elements - Nicholas C. Norman 1997
* Inorganic Chemistry - Martin Weller, Tina Overton, Jonathan Rourke, F. A. Armstrong 2014
* Organometallics and Catalysis: An Introduction - Manfred Bochmann 2015
* NMR Spectroscopy in Inorganic Chemistry - Jonathan A. Iggo 1999 [reprinted 2002]
* Arrow-pushing in Inorganic Chemistry: A Logical Approach to the Chemistry of the Main Group Elements - Abhik Ghosh, Steffen Berg 2014

Recommended texts:

* Advanced Inorganic Chemistry - F. Albert Cotton, F. Albert Cotton 1999
* Chemistry of the Elements - N. N. Greenwood, A. Earnshaw 1997
* Organometallics - Christoph Elschenbroich, Jose´ Oliveira 2006

Background texts:

* Frontier Orbitals and Organic Chemical Reactions - Ian Fleming
1. **Learning and teaching methods**

Total contact hours: 45

Private study hours: 105

Total study hours: 150

1. **Assessment methods**
	1. Main assessment methods

Assignment 1 (1 hour, 2.5%)

Assignment 2 (1 hour, 2.5%)

Assignment 3 (1 hour, 2.5%)

Assignment 4 (1 hour, 2.5%)

Laboratory Practical (6 hours, 5%)

Laboratory Practical (6 hours, 5%)

Laboratory Practical (6 hours, 5%)

Exam (3 hours, 75%)

13.2 Reassessment methods

Like-for-like

1. **Map of module learning outcomes (sections 8 & 9) to learning and teaching methods (section12) and methods of assessment (section 13)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Module learning outcome** | *8.1* | *8.2* | *8.3* | *8.4* | *8.5* | *8.6* | *8.7* | *8.8* | *9.1* | *9.2* | *9.3* | *9.4* | *9.5* | *9.6* |
| **Learning/ teaching method** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Private Study | x | x | x | x | x | x | x | x | x | x | x | x |  | x |
| Lectures | **X** | **X** | **X** |  |  |  |  |  | **X** | **X** | **X** | **X** |  |  |
| Laboratory Practicals | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| Workshops | **X** | **X** | **X** | **X** | **X** |  |  | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **Assessment method** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Assignments | **X** | **X** | **X** | **X** | **X** |  |  | **X** | **X** | **X** | **X** | **X** |  | **X** |
| Laboratory Practicals | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| Examination | **X** | **X** | **X** | **X** | **X** |  |  | **X** | **X** | **X** | **X** | **X** |  | **X** |

1. **Inclusive module design**

The School recognises and has embedded the expectations of current equality legislation, by ensuring that the module is as accessible as possible by design. Additional alternative arrangements for students with Inclusive Learning Plans (ILPs)/declared disabilities will be made on an individual basis, in consultation with the relevant policies and support services.

The inclusive practices in the guidance (see Annex B Appendix A) have been considered in order to support all students in the following areas:

a) Accessible resources and curriculum

b) Learning, teaching and assessment methods

1. **Campus(es) or centre(s) where module will be delivered**

Canterbury

1. **Internationalisation**

Chemistry is an inherently international subject, with teaching and research active across the globe, and this is facilitated by well-defined conventions in terminology and mathematical modelling which allow complex concepts to be communicated across language barriers. In recent years, main group and organometallic chemists have been the recipient of numerous Nobel prizes, these have been awarded to international collaborators and rivals e.g. Grubbs, Schrock and Chauvin, or Negishi, Suzuku and Heck. This module introduces students to the chemistry of these pioneers, as well as the fundamentals behind it and so enables them to interact with this community. The books for the reading list have been chosen, in part, to demonstrate the diversity of backgrounds of chemists working in the field.

**FACULTIES SUPPORT OFFICE USE ONLY**

**Revision record – all revisions must be recorded in the grid and full details of the change retained in the appropriate committee records.**

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| --- | --- | --- | --- | --- |
| Date approved | Major/minor revision | Start date of the delivery of revised version | Section revised | Impacts PLOs (Q6&7 cover sheet) |
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Revised FSO Jan 2018