1. **Title of the module**

CHEM6230 (CH623) – Main Group and Organometallic Chemistry

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

Division of Natural 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**

None

1. **The course(s) of study to which the module contributes**

Compulsory for BSc (Hons) Chemistry; BSc (Hons) Chemistry with a Foundation Year; BSc (Hons) Chemistry with a year in Industry; MChem Chemistry.

Not available as an elective module choice.

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

8.1 Demonstrate complete understanding and knowledge of 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 Demonstrate wide-ranging knowledge of 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 Demonstrate Abroad appreciation of developments at the forefront of some areas of chemical sciences.

8.4 Demonstrate comprehensive 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 Recognise and analyse problems and plan strategies for their solution by the evaluation, interpretation and synthesis of scientific information and data.

8.6 Display skills in the safe handling of chemical materials, considering 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 Display 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; and identifying Lewis acidic and Lewis basic sites within molecules.

8.8 Demonstrate 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:**

9.1 Demonstrate assured communication skills.

9.2 Display the ability to identify and undertake further training of a professional nature.

9.3 Demonstrate comprehensive problem-solving skills, relating to qualitative and quantitative information, extending to situations where evaluations have to be made on the basis of limited information.

9.4 Demonstrate confident numeracy and computational skills, including such aspects as error analysis, order-of-magnitude estimations, correct use of units and modes of data presentation.

9.5 Demonstrate assured interpersonal skills, relating to the ability to interact with other people and to engage in team working within a professional environment.

9.6 Demonstrate 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)**

Bochmann, M. (2015). *Organometallics and Catalysis: An Introduction*. Oxford: Oxford University Press.

Iggo, J.A. and Luzyanin, K. (2020). *NMR Spectroscopy in Inorganic Chemistry*, Second Edition. Oxford: Oxford University Press

Ghosh, A. and Berg, S. (2014). *Arrow-pushing in Inorganic Chemistry: A Logical Approach to the Chemistry of the Main Group Elements*. Hoboken, NJ: Wiley

Norman, N.C. (1997). *Periodicity and the s- and p-Block Elements*. Oxford: Oxford University Press.

Weller, M., Overton, T., Rourke,J., and Armstrong, F.A. (2014). *Inorganic Chemistry*, Sixth Edition. Oxford: Oxford University Press.

1. **Learning and teaching methods**

Total Contact Hours: 45

Total Private Study Hours: 105

Total Study Hours: 150

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

* Moodle Test 1 (1 hour) – 2.5%
* Moodle Test 2 (1 hour) – 2.5%
* Workshop 1 (1 hour) – 2.5%
* Workshop 2 (1 hour) – 2.5%
* Laboratory Practical Write-ups – 15%
* Exam (3 hours) – 75%

The laboratory practical write-ups are compulsory sub-elements and must be passed to complete the module.

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** |
| Lecture | **x** | **x** | **x** |  |  |  |  |  | **x** | **x** | **x** | **x** |  |  |
| Laboratory Practical | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |
| Workshop | **x** | **x** | **x** | **x** | **x** |  |  | **x** | **x** | **x** | **x** | **x** | **x** | **x** |
| **Assessment method** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Moodle Test | **x** | **x** | **x** | **x** | **x** |  |  | **x** | **x** | **x** | **x** | **x** |  | **x** |
| Workshop | **x** | **x** | **x** | **x** | **x** |  |  | **x** | **x** | **x** | **x** | **x** |  | **x** |
| Lab Practical Write-up | **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 Division 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.

**DIVISION 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 delivery of revised version | Section revised | Impacts PLOs (Q6&7 cover sheet) |
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| Revised FSO Jan 2018 |