UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Inorganic Chemistry 2
Module Code	CFS5016-B
Academic Year	2020/1
Credits	20
School	School of Chemistry and Biosciences
Subject Area	Chemistry
FHEQ Level	FHEQ Level 5
Pre-requisites	N/A
Co-requisites	N/A

Contact Hours	
Type	Hours
Learning Objects Interaction	17
Online Tutorials (Synchronous)	14
Directed Study	152
Practical Classes or Workshops	17

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Academic Year

Module Aims

The module aims to build on stage 1 theory and develop an understanding of the structures and reactivity of the transition metals, including the principles of coordination chemistry and organometallic chemistry. This will allow for further understanding of periodic trends and reactivity, with a more in depth understanding of applicable spectroscopic techniques. The chemistry of organometallic complexes will be discussed in terms of metal to ligand bonding, with introduction to Molecular Orbital theory of the d-block metals. Importantly, the chemistry of metal-carbon bonds, s-bonding and p-bonding and their importance in the chemistry of carbenes and catalytic reactions will be discussed. The students transferrable skills will be developed by working in groups to describe and communicate a variety of topics relating to coordination and organometallic chemistry.

Outline Syllabus

Chemistry of transition metals: Group trends & series trends for transition metals; Coordination number & isomerism; Different ligand types; Nomenclature of coordination compounds. Bonding models for metal ion coordination compounds: Crystal Field Theory & Ligand Field Theory (LFT); Calculation of crystal field stabilisation energy (CFSE); Consequences of CFSE; Jahn-Teller distortion; Electronic spectra, colour (UV-Vis) & magnetic properties of coordination complexes; Correlation diagrams, Stability & reaction mechanisms in coordination complexes.

Organometallic chemistry: the 18 electron rule; s and p-ligands and their relation to LFT; isolobal relationships; synergic bonding in metal carbonyls & p-olefins; bonding of multi-electron donor systems; Molecular Orbital Theory of metal-ligand bonding; metal-metal bonding; cluster compounds; electron counting conventions for structure prediction in clusters using Wade?s rules.

Selected catalytic applications of organometallic chemistry: Chemistry at the surface; Langmuir, adsorption, absorption and desorption of gases; heterogeneous catalysis; catalytic cycles.

Learning Outcomes

Outcome Number	Description
01	Determine and explain nomenclature, coordination numbers, chemical composition and chemical structures of coordination and organometallic compounds.
02	Apply Crystal Field and Ligand Field Theories to understand and predict electronic and magnetic properties of compounds.
03	Predict and discuss the stability and reaction mechanisms of coordination compounds.
04	Determine the electron counts, oxidation states and metal-ligand bonding in coordination and organometallic compounds.
05	Describe the bonding of metals to s and p ligands and demonstrate this with use of atomic and molecular orbital theory.
06	Identify and rationalise metal-metal bonding and metal-carbonyls in clusters chemistry, and predict the shapes using Wade?s rules.
07	Construct catalytic cycles to illustrate the applications of inorganic compounds in heterogeneous catalysis.
08	Use scientific literature databases, appraise primary literature and prepare a scientific presentation.
09	Use effective teamwork skills to analyse and evaluate key coordination and organometallic theory and concepts.

Learning, Teaching and Assessment Strategy
The module uses a blended approach to support learning and achievement. Students will engage with a series of weekly online learning packages. These will include short videos that address key concepts, a set of structured activities (reading, online discissions etc.) that 'scaffold' the learning, and a range of formative tasks that generate feedback on progress. Online sessions (tutorials/discussions) will also be used to support learning and monitor progress as student move through the curriculum. This will help in peer-learning activities. Formative feedback will be given at the end of these activities. In semester 2, students will be assigned to different groups to design and present a presentation to the cohort in a seminar style. Each group will be given a different core topic which covers different key concepts from the module content. The discussion forum in the VLE will be used to encourage peer learning activities with regular monitoring of the discussion threads by the module instructor. The participation in discussions will be assessed with respect to quality of contribution (questions, discussions, and answer). Assessment 1: An online seminar style presentation and online forum discussion based on the questions and answers using the VLE platform will cover LO's: 8-9. Assessment 2: An open book online test in January will cover LO's: 1-3. Assessment 3: A summative examination at the end of the module to cover LO's: 1-7.

Mode of Assessment				
Type	Method	Description	Length	Weighting
Summative	Presentation	Group work with a percent weighting derived from peer-review and online discussions	12 mins	30%
Summative	Examination - MCQ	Classroom MCQ test	1 hour 30 mins	30%
Summative	Examination - Open Book	Summative assessment: open book examination	2 hour	40%

Reading List
To access the reading list for this module, please visit https://bradford.rl.talis.com/index.html

Please note:
This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.

---

https://bradford.ac.uk