UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Inorganic Chemistry 2 (at Distance)
Module Code	CFS5024-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
Supervised time in studio/workshop	14
Lectures	30
Directed Study	156

Availability	
Occurrence	Location / Period
DLA	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, ?-bonding and ?-bonding and their importance in the chemistry of carbenes and catalytic reactions will be discussed. The students soft and 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; role of lanthanide contraction on group behaviour in transition metals; Coordination number & isomerism; Different kinds of ligands; 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 diagram, Stability & reaction mechanisms in coordination complexes.Organometallic chemistry: the 18 electron rule; ? and ?-ligands and their relation to LFT; isolobal relationships; synergic bonding in metal carbonyls & ?-olefins; bonding of multi-electron donor systems; Molecular Orbital Theory of the 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
LO1	Recall nomenclature and identify coordination numbers, chemical composition and chemical structures of coordination and organometallic compounds.
LO2	Apply Crystal Field and Ligand Field Theories to understand and predict electronic and magnetic properties of compounds.
LO3	Predict and discuss the stability and reaction mechanisms of coordination compounds.
LO4	Determine the electron counts, oxidation states and metal-ligand bonding in coordination and organometallic compounds.
LO5	Describe the bonding of metals to sigma and pi ligands and demonstrate this with use of atomic and molecular orbital theory.
LO6	Identify metal-metal bonding and metal-carbonyls in clusters chemistry, and predict the shapes using Wade's rules.
LO7	Construct catalytic cycles to illustrate the applications of inorganic compounds in heterogeneous catalysis.
LO8	Appraise relevant literature and specialist software packages to prepare a scientific presentation.
LO9	Develop effective teamwork skills to analyse and evaluate key coordination and organometallic theory and concepts.

Learning, Teaching and Assessment Strategy

Assessment 1: A 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 examination 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	On-line presentation	N/A	20%
Summative	Examination - Closed Book	Summative exam, taken in Bradford	2 hour	50%
Summative	Computer-based assessment	On-line assessment	1 hour	30%
Formative	Coursework	Tutorial Sheets	Tutorial Sheets	N/A

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.

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