



UNIVERSITI TEKNOLOGI MARA

CHM676: ORGANOMETALLIC CHEMISTRY

Course Name (English)	ORGANOMETALLIC CHEMISTRY APPROVED
Course Code	CHM676
MQF Credit	2
Course Description	The course provides students the knowledge of the chemistry of compounds containing metal-carbon bonds in terms of the bonding of the organic group to metals via the lone pair of electrons as well as the π -electrons (olefin complexes). The application of the 18-electron rule in such cases are discussed. The characterization of organometallic through infrared and ^{13}C Nuclear Magnetic Resonance spectroscopy are studied. The reactions of organometallic compounds and their uses of some organometallic complexes namely as catalysts are also discussed.
Transferable Skills	Knowledge on advanced coordination chemistry, bonding of organic ligands to metal centres, properties, characterization and reactions. Catalytic properties of organometallic chemistry. Wider view of life and career of famous organometallic Nobel Prize winners.
Teaching Methodologies	Lectures, Discussion, Presentation
CLO	<p>CLO1 Describe the chemistry and bonding of carbonyl and olefin complexes, the chemical properties of metal alkyls, metal aryls as well as carbene and carbyne complexes</p> <p>CLO2 Predict the stability of an organometallic compound through application of the EAN rule</p> <p>CLO3 Characterize organometallic compounds and distinguish their isomers by using infrared and ^{13}C NMR spectroscopy</p> <p>CLO4 Apply the knowledge gained on reactions of organometallic compounds in their involvement as catalysts in industry</p> <p>CLO5 Present the finding of a team project on a topic related to organometallic chemistry</p>
Pre-Requisite Courses	No course recommendations
Topics	
1. Introduction to Organometallic Chemistry 1.1) Carbonyl Complexes – CO as a pi-acid ligand 1.2) Metal-CO bonding Mechanism 1.3) Binary and Homoleptic Carbonyl Complexes 1.4) 18 Electron Rule (EAN Rule – Effective Atomic Number) 1.5) Substituted Carbonyls	
2. Bonding of Organic Ligands to Metals 2.1) Olefin Complexes (pi-donor Complexes) 2.2) The EAN Rule for pi-donor Complexes 2.3) Ferrocene compounds	
3. Structural Characterization of Organometallic Compounds 3.1) Infrared Spectra of Carbonyl Complexes 3.2) Distinguishing isomers of organometallic compounds with CO ligands 3.3) Experimental Evidence for pi Back-Donation 3.4) ^{13}C NMR of organometallic compounds	

4. Compounds with Metal-Carbon sigma-Bonds 4.1) Metal Alkyls 4.2) Metal Aryl Complexes 4.3) Multiple Metal-Carbon Bonds 4.4) Carbene and alkylidene complexes (M=C) 4.5) Carbyne and alkylidyne complexes (M≡C)
5. Some Reactions of Organometallic Compounds 5.1) Substitution Reactions 5.2) Insertion Reactions 5.3) Oxidative Addition Reactions 5.4) Reductive Elimination Reactions
6. Uses of Some Organometallic Compounds - Catalysis 6.1) Deuteration of Benzene 6.2) Monsanto Acetic Acid Process 6.3) Wilkinson's Catalysis 6.4) Wacker Oxidation of Alkene to Aldehyde
7. Famous Organometallic Scientists 7.1) The life, education and famous organometallic works of selected Nobel Prize winners.

Assessment Breakdown	%
Continuous Assessment	75.00%
Final Assessment	25.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	Assignment 1	25%	CLO5
	Test	Test 1	25%	CLO1
	Test	Test 2	25%	CLO2

Reading List	Recommended Text
	<ul style="list-style-type: none"> Bodie E. Douglas, Darl H. McDaniel, John J. Alexander 1994, <i>Concepts and models of inorganic chemistry</i>, Third Ed., Wiley New York [ISBN: 0-471-62978-2]

Article/Paper List
This Course does not have any article/paper resources

Other References
<ul style="list-style-type: none"> Book Gary L. Miessler, Paul J. Fischer and Donald A. Tarr 2013, <i>Inorganic Chemistry, Fifth Edition</i>, Prentice Hall, ISBN:0321811054