UNIVERSITAS NEGERI YOGYAKARTA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
DEPARTMENT OF CHEMISTRY EDUCATION
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Bachelor of Education in Chemistry **MODULE HANDBOOK**

Module name:	**Coordination Chemistry and Organometallic**
Module level, if applicable:	Undergraduate
Code:	KIP 6402
Sub-heading, if applicable:	-
Classes, if applicable:	2
Semester:	5th
Module coordinator:	Prof. AK. Prodjosantoso, Ph.D.
Lecturer(s):	**Dra. Rr. Lis Permana Sari, M.Si.;** M. Pranjoto Utomo, M.Si.
Language:	Bahasa Indonesia and English
Classification within the curriculum:	Compulsory Subject
Teaching format / class hours per week during the semester:	150 minutes lectures, 180 minutes individual study, and 180 minutes structured activities per week.
Workload:	Total workload is 136 hours per semester which consists of 150 minutes lectures, 180 minutes structured activities, and 180 minutes individual study per week for 16 weeks.
Credit points:	3 SKS (4.92 ETCS)
Prerequisites course(s):	- Nonmetal Inorganic Chemistry - Metal Inorganic Chemistry
Course outcomes:	After taking this course, the students are expected to be able to: CO1. calculate the theoretical magnetic moments of the transition species and lower their spectroscopic terms correctly and carefully CO2. reflect and think about the controversy of lanthanide and actinoide membership in TPU and react wisely CO3. compile reports on the results of practicum of various complex compounds based on the experimental results honestly CO4. explain the limitations of the transition elements, the character of the electronic configuration, and variations in the degree of oxidation; CO5. explain the catalytic role, and magnetic properties of transition species; CO6. explain the characteristics and formulas of complex compounds; CO6. identify coordination numbers of complex compounds, central atomic oxidation numbers, and multidentate ligands; CO7. name complex compounds according to IUPAC, CO8. calculate the effective atomic number of various complex compounds including carbonil complex

	compounds; CO9. explain the type of hybridization in relation to geometry, spin properties, and the magnetic properties of complex compounds; CO10. predict the geometry of a complex compound based on Valence Bond Theory (VBT); CO11. describe the diagram of the separation of d orbitals in the cube field; CO12. determine the electronic configuration and in the field of ligand octahedron strong / weak da tetrahedron, its relationship with the nature of spin and magnetic properties; CO13. calculate the field stabilization energy Krista complex compound in relation to separation energy, 10 Dq; CO14. give an example of the distortion of Jahn Teller;explain the relationship of color to electronic transitions in complex compounds; CO15.depicts diagrams of molecular orbitals of complex compounds tetraedron and octahedron; CO16.describe the geometry of complex compounds and their various isomers; CO17.distinguish thermodynamic stability and kinetics; explain the factors that affect the stability of compound compounds; CO18. explain the mechanism of associative and dissociative reactions, the mechanism of trans effects, and the mechanism of redox reactions; CO19. understand the controversy of lanthanide and actinoide membership in TPU; CO20. explain the concept of organometallics; CO21.describe the organometallic compound as low as possible; CO22.explain the mechanism of reaction of organometallic compounds including the mechanism of oxidative addition, the mechanism of hydride elimination, the mechanism of transmetallization, carbomethacation, and silimetalasi; CO23.mention examples of reactions to several organometallic reagents and their applications and examples of the use of organometallic compounds in the industry. CO24.calculate the theoretical magnetic moment of the transition species and decrease the spectroscopic term; describe bond formulations in complex compounds according to the Blomstrand-Jorgensen model, and Werner's model; CO25.do the Complex Alumunium Compounds, chromium, iron, cobalt, nickel, copper and conclude the results in the report; characterization of various properties of complex compounds formed from trasisi compounds; C026.write down the characteristics of electronic lantanoida and actinoide configurations.
Content:	This course discusses Coordination Chemistry and organometallic compounds with a weighting of 3 theoretical credits and 1 integrated practicum credit. Chemistry

<table>
<tr><td></td><td>Coordination talks about the Chemical Transition Elements: understanding, electronic configuration, catalytic properties, magnetic properties, and spectroscopic terms. Complex compounds: boundaries, formulations, bonds, coordination numbers, formula writing formula, nomenclature, history of development of complex compound formulations according to Blomstrand-Jørgensen chain theory, Werner's theory, isomerism, and application of complex compounds. The concept of effective atomic number, and valence bond theory (hybridization), the theory of Crystal Fields (ligand field theory): d orbitals division and electronic configurations in octahedron, tetrahedron and square fields; energy of crystal field stability, Jahn-Teller distortion, crystal field strength (ligand) and how to measure it, color and introduction of electronic spectrum. Molecular orbital theory of complex compounds: Thermodynamics and kinetics of complex compounds: stability and instability, and constants of equilibrium; reaction mechanism: ligand substitution, trans effect, redox reaction. Chemical transition elements in (4f and 5f), and applications of complex compounds. Practicum of Aluminum Complex Compounds, chromium, iron, cobalt, nickel, copper with a variety of ligands. Organometallic compounds discuss the concepts and history of organometallic compounds, the mechanism of reaction of organometallic compounds includes the mechanism of oxidative addition, the mechanism of hydride elimination, the mechanism of transmetallization, carbomethacilation, and silylmetallation; example of the reaction of some organometallic reagents and their application. And the use of organometallic compounds in industry.</td></tr>
<tr><td>Study / exam achievements:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is marked very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not taken into account in the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude. The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>CO1-CO26</td><td>Participation
Assignment
Mid-term exam
Final Exam</td><td>Presentation / written test</td><td>10%
30%
20%
40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>References:</td><td>Kristian H. Sugiyarto; Kimia Anorganik Transisi (Graha Ilmu), 2010
A.K. Prodjosantoso ; Kimia Organologam , UNY Press, 2012
Eugene Pressley (Editor). Organometallic Chemistry. Publisher: Larsen and Keller Education, 2018
Geoffrey A. Lawrence. Introduction to Coordination Chemistry.</td></tr>
</table>

	John Wiley & Sons, Ltd. 2010 Rayner-Canham, G. and Tina Overton, "Descriptive Inorganic Chemistry", 6th Edition. W. H. Freeman and Company, INC., New York, 2014. Robert H. Crabtree. The Organometallic Chemistry of the Transition Metals 6th Edition. Wiley. 2014. Tim Penyusun, Petunjuk Praktikum Kimia Koordinasi dan Organologam, FMIPA UNY. 2018.

PLO and CO mapping

	PLO					
	Attitude		Knowledge	Specific Skill	General Skill	
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CO1			√			
CO2			√			
CO3			√			
CO4			√			
CO5			√			
CO6			√			
CO7			√			
CO8			√			
CO9			√			
CO10			√			
CO11			√			
CO12			√			
CO13			√			
CO14			√			
CO15			√			
CO16			√			
CO17			√			
CO18			√			
CO19			√			
CO20			√			
CO21			√			
CO22			√			
CO23			√			
CO24			√			
CO25				√		
CO26				√		