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

Module name:	Chemical Application of Group Theory
Module level, if applicable:	Undergraduate
Code:	KMA 6209
Sub-heading, if applicable:	-
Classes, if applicable:	-
Semester:	7th
Module coordinator:	Prof. AK Prodjosantoso, Ph.D.
Lecturer(s):	Prof. KH Sugiyarto, Ph.D.
Language:	English
Classification within the curriculum:	Compulsory Subject
Teaching format / class hours per week during the semester:	100 minutes lectures, 120 structured activities and 120 individual study per week
Workload:	Total workload is 90,67 hours per semester which consists of 100 minutes lectures, 120 structured activities and 120 individual study per week for 16 weeks
Credit points:	2 SKS (3 ECTS)
Prerequisites course(s):	-
Course Outcomes	After taking this course, the students are expected to be able to: CO1: Explain the application of group theory concept in chemical research. CO2: Explains the concept of group theory: boundary of 5 types of elements, symmetry operations, geometry hybridization models, orbital diagrams, and the character of each symmetry operation. CO3: Analyzing the findings of research results in the application of group theory chemistry and innovation
Content:	Chemistry Group Theory explains the elements and operations of symmetry, and their application in orbital objects and various chemical geometries, the basic requirements of a point group, and their application in determining the character of non-generic representations, matrices for degenerate representations to construct character tables, application of group theory in the theory of chemical bonds: hybridization models uk for various simple and complex molecules, application of group theory in chemical bond theory: hybridization models π for various simple and complex molecules, application of group theory in molecular orbitals for various simple molecules. 1. Molecular symmetry: definition of elements and symmetrical operations, combination of symmetrical operations, classes, and point groups.

<table>
<tr><td></td><td>2. Group theory: definition of groups, representations of point group notations, non-degenerate representations, matrices and degenerate representations, and character tables
3. Group theory application: sigma bonding hybridization, σ, to construct trigonal-ab3, tetrahedron-ab4, square-ab4, trigonalbipiramid-b5, pyramid square-ab5, and octahedron-ab6
4. Bond hybridization π
5. Application of group theory in molecular orbital theory: H2O, BF3, ab4 tetrahedron, and octahedron ab6
6. Application of group theory: crystal field theory, d orbital division in symmetry Td and Oh</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,
CO2,
CO3,</td><td>a. Assignments
b. Activity
c. Final Exam
d. Midterm Exam</td><td>Presentation / written test</td><td>20%
20%
30%
30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Handout, Board, LCD Projector, Laptop/Computer, Module</td></tr>
<tr><td>References:</td><td>• Cotton, F. H. (2003). Chemical Applications of Group Theory. India: Wiley
• Kristian H. Sugiyarto, (2001), Common Textbook: Aplikasi Teori Group: Teori Medan Kristal, pembelahan orbital d dalam simetri Td dan Oh, Jurusan Pendidikan Kimia, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Negeri Yogyakarta
• Shriver, D.F., Langford, C.H., Atkins, P.W., (1990), Inorganic Chemistry, Oxford Press, New York, USA
• Oxtoby, D.W., (2002), Principles of Modern Chemistry, Nelson Thomson Learning Inc, Toronto, Canada.
• Cotton, F.A. (1990), Chemical Applications of Group Theory, John Wiley and Sons, 3rd Edition
• Rietman, E.A., Karp, R.L., and Tuszynski, J.A. (2011), Review and application of group theory to molecular system biology, Theoretical Biology and Medical Modelling, 8, 21</td></tr>
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PLO and CO mapping

	PLO			
	Attitude	**General Skill**	**Knowledge**	**Specific Skill**

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
CO1					√					
CO2							√			
CO3								√		