



MINISTRY OF EDUCATION, CULTURE, RESEARCH,  
AND TECHNOLOGY

UNIVERSITAS NEGERI SURABAYA

FACULTY OF MATHEMATICS AND NATURAL SCIENCES

DEPARTMENT OF CHEMISTRY

Ketintang Campus, Jalan Ketintang, Surabaya 60231

Telephone : +6231- 8298761, email: [kimia@unesa.ac.id](mailto:kimia@unesa.ac.id), Laman : <http://kimia.fmipa.unesa.ac.id>

## MODULE HANDBOOK

Module Name:	Quantum Chemistry
Module level:	Bachelor
Course Code :	8420403141
Abbreviation, if applicable:	-
Course included in the module, if applicable:	-
Semester/term:	3 <sup>rd</sup> / Second Year
Module coordinator(s):	Prof. Dr. Suyono, M.Pd.
Lecturer(s):	Dr. IGM Sanjaya, M.Si., Samik, S.Si., M.Si., and Findiyani E. Asih, S.Pd., M.Pd.
Language:	Indonesian
Classification within the Curriculum:	Compulsory Course
Teaching format/class hours per week during the semester:	3 hours lecturers (50 min per hours)
Workload:	3 x 50 minutes lectures, 3 x 60 minutes structured activity, 3 x 60 minutes individual activity, 14 weeks per semester, 119 total hours per semester ~ 4.77 ECTS**
Credit unit:	3 CU = 3 x 1.59 = 4.77 ECTS
Prerequisite course(s):	Basic Chemistry I
Targeted learning outcomes:	<ol style="list-style-type: none"><li>1. Students can take advantage of digital transformation and various other learning resources to support their understanding of quantum chemistry.</li><li>2. Students can master the concepts and basic principles of quantum chemistry which are appropriate for the structure, bonds, and characteristics of various materials in physical chemistry.</li><li>3. Students are able to make decisions in formulating solutions to quantum chemical problems related to atomic structure, chemical bonds, molecular structure, molecular symmetry, spectroscopy and molecular interactions.</li><li>4. Students have good morals, ethics and personality in completing quantum chemistry assignments independently or in groups and are responsible for communicating the results.</li></ol>



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	5. Students have Ability to integrate the concept of technopreneurship in quantum chemistry																																								
Content:	<ol style="list-style-type: none"><li>1. Basic Concepts and Principles of Quantum Chemistry.</li><li>2. The application of quantum chemistry to translational, vibration and rotation motion</li><li>3. The application of quantum chemistry to the structure of the hydrogen atom and the atom with many electrons</li><li>4. Chemical bond theory (Valence bond theory and molecular orbital theory)</li><li>5. Molecular symmetry</li><li>6. Molecular spectroscopy</li><li>7. Molecular interactions</li></ol>																																								
Study / exam achievements:	<p>The final grade (NA) is calculated based on the following ratio:</p> <table border="1"><thead><tr><th>Assessment Components</th><th>Percentage of contribution</th></tr></thead><tbody><tr><td>Participation</td><td>20%</td></tr><tr><td>Assignment</td><td>30%</td></tr><tr><td>Mid-semester test</td><td>20%</td></tr><tr><td>Final semester test</td><td>30%</td></tr></tbody></table> <p>Grade conversion of 0-100 scale into 0-4 scale is set as below:</p> <table border="1"><thead><tr><th>Letter</th><th>Number</th><th>Grade Interval</th></tr></thead><tbody><tr><td>A</td><td>4,00</td><td><math>85 \leq A \leq 100</math></td></tr><tr><td>A-</td><td>3,75</td><td><math>80 \leq A- &lt; 85</math></td></tr><tr><td>B+</td><td>3,50</td><td><math>75 \leq B+ &lt; 80</math></td></tr><tr><td>B</td><td>3,00</td><td><math>70 \leq B &lt; 75</math></td></tr><tr><td>B-</td><td>2,75</td><td><math>65 \leq B- &lt; 70</math></td></tr><tr><td>C+</td><td>2,50</td><td><math>60 \leq C+ &lt; 65</math></td></tr><tr><td>C</td><td>2,00</td><td><math>55 \leq C &lt; 60</math></td></tr><tr><td>D</td><td>1,00</td><td><math>40 \leq D &lt; 55</math></td></tr><tr><td>E</td><td>0,00</td><td><math>0 \leq E &lt; 40</math></td></tr></tbody></table>	Assessment Components	Percentage of contribution	Participation	20%	Assignment	30%	Mid-semester test	20%	Final semester test	30%	Letter	Number	Grade Interval	A	4,00	$85 \leq A \leq 100$	A-	3,75	$80 \leq A- < 85$	B+	3,50	$75 \leq B+ < 80$	B	3,00	$70 \leq B < 75$	B-	2,75	$65 \leq B- < 70$	C+	2,50	$60 \leq C+ < 65$	C	2,00	$55 \leq C < 60$	D	1,00	$40 \leq D < 55$	E	0,00	$0 \leq E < 40$
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Media:	Computer, LCD, White board, internet																																								
Learning Methods	Individuals assignment, group assignment, discussion, and presentation																																								
Literature:	<ol style="list-style-type: none"><li>1. Atkins, P., Paula, J.d., and Keeler, J. 2018. Atkin's Physical Chemistry, 11th edition. New York: Oxford University Press.</li><li>2. Levine, Ira N. 2014. Quantum chemistry, 7th edition. New York: Pearson Education, Inc</li></ol>																																								



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	3. Mortimer, R.G. 2008, Physical Chemistry, 3th edition, London: Elsevier Inc.
Notes:	<p>*1 credit unit or <i>skls</i> in learning process = three periods consist of: (a) scheduled instruction in a classroom or laboratory (50 minutes); (b) structured activity (60 minutes); and (c) individual activity (60 minutes) according to the Regulation of Indonesia Ministry of Research, Technology, and Higher Education No. 44 Year 2015 jo. the Regulation of Indonesia Ministry of Research, Technology, and Higher Education No. 50 Year 2018.</p> <p>**1 credit unit or <i>skls</i> = 1.59 ECTS according to Rector Decree Of Universitas Negeri Surabaya No. 598/UN38/HK/AK/2019</p>