

## 7. Module VII: Chemistry

### 7.1. Module Objectives

On completion of this module, the students will:

- Students will be able to define the basic concept of chemistry in its application to life science and technology
- Students will be able to define and describe basic principles about biomolecular structure and define basic chemical reaction in living cell
- Students will be able to define and apply technique, methods, and procedure qualitative analysis, gravimetry, and titrimetry
- Students will be able to apply analytical problems analysis and able to discover the development of chemical science knowledge
- Students will be able to define the relationship between structure and reactivity of organic compound and describe various basic reaction in organic compound of its application in daily life

### 7.2. Module Data

Person in charge	Faculty of Natural Science and Mathematics
Total Credits	9
Course	KI -3061 Biochemistry
	KI-2051 Analytical Chemistry
	KI-2122 Organic Chemistry
Modul Examination	Written Test

#### 7.2.1. Sub-module I: Biochemistry

Module Name:	Biochemistry
Module Level:	Undergraduate
Abbreviation, if applicable:	KI 3061
Sub-heading, if applicable:	
Courses included in the module, if applicable:	
Semester/term:	4
Module coordinator(s):	
Lecturer(s):	Dr. Made Puspari Widhiastuty
Language:	Bahasa Indonesia
Classification within the curriculum:	General Studies / <del>Major Subject</del> / <del>Elective Studies</del>
Teaching format / class hours per week during the semester:	2 hours lectures, 1 hours tutorial
Workload:	2 hours lectures, 1 hours tutorial and structured

	activities, 2 hours individual study, 2 hours laboratory work per week, 16 weeks per semester, and total 144 hours a semester
Credit Points:	3(1)
Requirements:	-
Learning goals/competencies:	Students will be able to define and describe basic principles about biomolecular structure and define basic chemical reaction in living cell
Content:	This course activities consist of lectures and practice with scope: the structure of biomacromolecules and their monomers. Chemical properties of biomacromolecules, and their related functions, such as protein as an enzymes, kinetics of chemical reactions catalyzed by enzymes. Biomolecule transport processes inside the cell, as well as bioenergetics aspect. Overview of metabolism, the relationship between carbohydrates, lipids, proteins and nucleic acids metabolism, with focused on carbohydrate metabolism, including glycolysis, alcohol fermentation, lactic acid fermentation, carboxylic acid cycle, and oxidative phosphorylation/ electron transport. While for anabolism, will be discussed on the synthesis of carbohydrates, namely gluconeogenesis and also the photosynthetic reaction, and the regulation of carbohydrate catabolism and anabolism. Discussion of nucleic acid biomolecules function focused on the flow of genetic information.
Study/exam achievements:	Students are considered to be competent and pass if at least get 50% of maximum mark of the exams, homework, laboratory work, and research based learning.
Forms of Media:	Slides and LCD projectors, blackboards, lab.
Literature:	<ol style="list-style-type: none"> <li>1. Berg, JM, Tymoczko, JL, Stryer, L, Biochemistry, 7th ed., WH Freeman and Co., New York, 2012.</li> <li>2. Nelson, DL, Cox, MM, Lehninger Principles of Biochemistry, 6th ed., WH Freeman and Co., New York, 2012.</li> <li>3. Devlin, TM, <i>Textbook of Biochemistry with clinical correlations</i>, 7th ed., Wiley &amp; Sons, New York, 2010</li> <li>4. Voet, DJ, Voet, JG, Pratt, CW, Principles of Biochemistry, John Wiley &amp; Sons, New York, 2013.</li> </ol>

Notes	<p>Difference syllabus between microbiology program and pharmacy program</p> <ol style="list-style-type: none"> <li>i. Microbiology need chemical fotosynthesis</li> <li>ii. Microbiology no needs understanding about drug interaction with macromolecules</li> <li>iii. Microbiology need similar basic biochemical understanding, which are: structure and function of macromolecule (protein, nucleic acid, carbohidrat, and lipid), metabolism (catabolism and anabolism) and its control, along with genetic process flow of chemical process</li> </ol>
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### 7.2.2. Sub-module II: Analitical Chemistry

Module Name:	Analitical Chemistry
Module Level:	Undergraduate
Abbreviation, if applicable:	KI 2122
Sub-heading, if applicable:	
Courses included in the module, if applicable:	
Semester/term:	1
Module coordinator(s):	
Lecturer(s):	Dr. Megawati Santoso
Language:	Bahasa Indonesia
Classification within the curriculum:	General Studies / <del>Major Subject</del> / Elective Studies
Teaching format / class hours per week during the semester:	2hours lectures, 1 hours tutorial
Workload:	2 hours lectures, 1 hours tutorial and structured activities, 2 hours individual study, 3 hours laboratory work per week, 16 weeks per semester, and total 144 hours a semester
Credit Points:	3(1)
Requirements:	-
Learning goals/competencies:	<p>Students will be able to define and apply technique, methods, and procedure qualitatife analysis, gravimetry, and trimetry</p> <p>Students will be able to apply analytical problems analysis and able to discover the development of Chemistry knowledge</p>
Content:	This course includes (1) BasicAnalytical Chemistry: process of analysis, evaluation of analytical results, chemical calculations, review of the chemical equilibrium, (2) qualitative analysis includes the

	identification of chemical compounds in a structured way, (3) the conventional analysis methods include gravimetric and titrimetric; (4) introduction to instrumental analytical methods, that includes colorimetric and potentiometric methods.
Study/exam achievements:	Students are considered to be competent and pass if at least get 50% of maximum mark of the exams, homework, laboratory work, and research based learning.
Forms of Media:	Slides and LCD projectors, blackboards, lab.
Literature:	<ol style="list-style-type: none"> <li>1. Harvey D., <i>Modern Analytical Chemistry</i>, Mc Graw Hill, 2000</li> <li>2. Skoog, D.A., <i>et al</i>, '<i>Fundamentals of Analytical Chemistry</i>' 8<sup>th</sup> ed., Saunders College Publisher, 2004</li> </ol>
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### 7.2.3. Sub-module III: Organic Chemistry

Module Name:	Organic Chemistry
Module Level:	Undergraduate
Abbreviation, if applicable:	KI-2051
Sub-heading, if applicable:	
Courses included in the module, if applicable:	
Semester/term:	3
Module coordinator(s):	
Lecturer(s):	Dr. Aminudin Sulaeman
Language:	Bahasa Indonesia
Classification within the curriculum:	General Studies / <del>Major Subject</del> / Elective Studies
Teaching format / class hours per week during the semester:	2 hours lectures, 1 hours tutorial
Workload:	2 hours lectures, 1 hours tutorial and structured activities, 2 hours individual study, 2 hours laboratory work per week, 16 weeks per semester, and total 144 hours a semester
Credit Points:	3
Requirements:	-
Learning goals/competencies:	Students will be able to define the relationship between structure and reactivity of organic compound and describe various basic reaction in organic compound of its application in daily life
Content:	Main topics of this course are concerning organic nomenclature, chemical bonding including resonance concept and acid-base concept, organic functional groups, and the relationship between structures of

	<p>molecules, physical properties and chemical properties of organic compounds. The structure topics discuss on chemical bonding, covalent bond properties that related to the static aspect of molecules (including stereochemistry) as well as its dynamic aspect (conformation). The physical properties topic includes the state of materials, solubility, melting point and boiling points; the chemical properties topic includes acid-base properties, oxidation and reduction reaction, electrophylic and nucleophylic addition reaction, electrophylic and nucleophylic substitution reaction, elimination and free-radical reaction especially halogenation reaction. Other topics are concerning the application of organic chemistry knowledge in understanding of the application of organic compounds and reactions in living organism as well as in industrial applications.</p>
Study/exam achievements:	<p>Students are considered to be competent and pass if at least get 50% of maximum mark of the exams, homework, laboratory work, and research based learning.</p>
Forms of Media:	<p>Slides and LCD projectors, blackboards, lab.</p>
Literature:	<ol style="list-style-type: none"> <li>1. T.W.G. Solomon dan C.B. Fryhle, 2011, <i>Organic Chemistry</i>, 10<sup>th</sup> edition, John Wiley and Sons (Asia), Wiley International Student version</li> <li>2. H. Hart, L.E. Craune dan D.J. Hart, 2003, <i>Kimia Organik: Suatu Kuliah Singkat</i>, Edisi ke-11, penterjemah: SS Achmad, Penerbit Erlangga, Jakarta.</li> <li>3. J Clayden, N Greeves, S Warren dan P Wothers, 2001. <i>Organic Chemistry</i>, Oxford University Press.</li> </ol>