

# PORTFOLIO

COURSE:  
AGROCHEMICALS  
(PAG11115)



## TEACHING TEAM:

Dr. Ir. Mery Hasmeda, M.Sc.  
Dr. Ir. Susilawati, M.Si.  
Dr. Irmawati, S.P., M.Sc., M.Si.  
Fitra Gustiar, S.P., M.Si.  
Dr. Fikri Adriansyah, S.Si.

AGRONOMY STUDY PROGRAM  
FACULTY OF AGRICULTURE  
UNIVERSITAS SRIWIJAYA

## A. COURSE IDENTITY

Module designation	<i>Agrochemicals</i>	
Semester (s) in which the module is taught	1 <sup>st</sup> semester / 1 <sup>st</sup> year	
Person responsible for the module	1. Dr. Ir. Mery Hasmeda, M.Sc. 2. Dr. Ir. Susilawati, M.Si. 3. Dr. Irmawati, S.P., M.Sc., M.Si. 4. Fitra Gustiar, S.P., M.Si. 5. Dr. Fikri Adriansyah, S.Si.	
Language	Indonesian	
Relation to curriculum	Compulsory Course	
Type of teaching, contact hours	1. Lectures (explanation, discussion) 2. Structured assignment 3. The class size 20-80 students per class 4. Contact hours for lecture are 23.33 hours per semester 5. Total hours practical is 19.83 hours per semester	
Workload (incl. Contact hours, self-study hours)	1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester 2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester 3. Self-study: 2 x 60 minutes per week or 24 hours per semester	
Credit points	3 credits (equivalent with 3.79 ECTS)	
Requirements according to the examination regulations	A student must have attended the lecture at least 85% of total lectures and submitted all the assignments prior to join the final exam	
Module objectives/intended learning outcomes	After completing this course, a student is expected to:	
CLO=Course Learning Outcomes	<b>CLO1</b>	understand and be able to explain the basic chemistry and carbon chemistry
	<b>CLO2</b>	understand and be able to explain the chemical properties of organic compounds
	<b>CLO3</b>	understand and be able to explain the structure and function of biomolecules
	<b>CLO4</b>	understand and be able to explain about the chemicals used in agricultural activities

Content	<ol style="list-style-type: none"> <li>1. Introduction of agrochemicals.</li> <li>2. Atomic structure and electron configuration.</li> <li>3. Chemical bond</li> <li>4. Organic chemistry: nomenclature of organic compounds &amp; functional groups.</li> <li>5. Structure and function of water.</li> <li>6. Acid, alkaline and salt.</li> <li>7. pH, solution and indicator.</li> <li>8. Structure and function of carbohydrate.</li> <li>9. Structure and function of protein.</li> <li>10. Structure and function of lipid and lipid acids.</li> <li>11. Concentration, ppm, %, molar concept, molarity, normality.</li> <li>12. Hydroponic nutrient solution media and tissue culture.</li> <li>13. Soil, nutrients and fertilization.</li> <li>14. Pesticides and applications.</li> </ol>
Examination forms	Quiz, Mid-terms and Final Examination
Media employed	LCD, whiteboard, websites
Reading List	<ol style="list-style-type: none"> <li>1. Mido Y. and M. Satake. 1994. Chemistry for Agriculture and Ecology. Discovery Publishing House.</li> <li>2. Timberlake, K.C. and W. Timberlake. 2014. Basic Chemistry. Pearson Education.</li> <li>3. Roberts, T.R. 2000. Metabolism of Agrochemicals in Plants. John Wiley and Sons.</li> <li>4. Mansyur, N.I., E.H. Pudjiwati, A. Murti Laksono. 2021. Pupuk dan Pemupukan. Syiah Kuala University Press.</li> <li>5. Anac, D., Matin-Prevel, P. 1999. Improved Crop Quality by Nutrient Management. Kluwer Academic Publishers.</li> <li>6. Michael, F, Waxman. 1998. Agrochemical and Pesticide Safety Handbook. CRC Press.</li> <li>7. Fageria, N.K. 2014. Nitrogen Management in Crop Production CRC Press.</li> <li>8. Knowles, D.A. 1998. Chemistry and Technology of Agrochemical Formulations. Springer Dordrecht.</li> <li>9. Prasad, M.N.V. 2020. Agrochemicals Detection, Treatment and Remediation. Elsevier.</li> <li>10. Plimmer, J.R., Gammon, D., Nancy, N., Ragsdale. 2002. Encyclopedia of Agrochemicals. Wiley Online Library.</li> <li>11. Cremlyn, R.J.W. 1991. Agrochemicals: Preparation and Mode of Action. Wiley; 2nd edition.</li> <li>12. Goodwin., Mercer. 1988. Introduction to Plant Biochemistry. Pergamon Press.</li> </ol>

	<ol style="list-style-type: none"><li>13. Prasad, M.N.V., Strzalka, K. 2002. <i>Physiology and Biochemistry of Metal Toxicity and Tolerance in Plants</i>. Kluwer Academic Publishers.</li><li>14. Khan, N.A. 2006. <i>Ethylene Action in Plants</i>. Springer.</li><li>15. Research publications related to research agrochemicals.</li></ol>
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## B. STUDY LEARNING PLAN

Course Name : Agrochemicals

Code/Credits : PAG11115

Course Status : Compulsory

### Short Description

This course is an introduction to agricultural chemistry related to the principles of stoichiometry and analytical chemistry consisting of the topics of atoms, molecules, chemical bonds, functional groups, water, pH, acid-base, salts, redox reactions and chemical balances, concentration and molarity concepts, plant biomolecules, plant nutrients, soil solutions, chemicals used in agriculture activities such as fertilizers, lime, pesticides, and growth regulators.

### Objectives

After the completion of this course, students will be able to understand, describe and explain the basic concept of chemistry and organic chemistry, chemical properties of organic compounds, structures and functions of biomolecules, and also the chemicals used in the agricultural activities.

### Mapping of Course Learning Outcomes (CLO)-Program Learning Outcomes (PLO)

CLO	Description	PLO*			
		AV	KC	GS	SS
CLO1	understand and be able to explain the basic chemistry and carbon chemistry	8; 10	1	1; 2	1
CLO2	understand and be able to explain the chemical properties of organic compounds	8; 10	1	1; 2	1
CLO3	understand and be able to explain the structure and function of biomolecules	8; 10	1	1; 2	1
CLO4	understand and be able to explain about the chemicals used in agricultural activities	8; 10	1	1; 3	5

AV = Attitude and Value; KC = Knowledge Competence; GS = General Skills; SS = Specific Skills

\*Details are in the Study Program Curriculum file

## Course Outlines

### Face-to-Face

No.	Course materials	Duration (face-to-face) (minutes)	CLO			
			1	2	3	4
1	Overview: Introduction of agrochemicals.	110	√			
2	Atomic structure and electron configuration.	110	√			
3	Chemical bond.	110	√	√		
4	Organic chemistry: nomenclature of organic compounds & functional groups.	110		√		
5	Evaluation 1 (1-4)	110	√	√		
6	Structure and function of water.	110	√			
7	Acid, alkaline and salt, pH, solution and indicator.	110	√	√		
8	Structure and function of carbohydrate.	110		√	√	
9	Structure and function of protein.	110		√	√	
10	Structure and function of lipid and lipid acids.	110		√	√	
11	Evaluation 2 (6-10)	110		√	√	
12	Concentration, ppm, %, molar concept, molarity, normality.	110	√	√		
13	Hydroponic nutrient solution media and tissue culture.	110		√		√
14	Soil, nutrients and fertilization.	110		√		√
15	Pesticides and applications.	110		√		√
16	Evaluation (12-15)	110		√		√

### Outcomes and Assessment

No.	Week	Sub-CLO	Assessment	Percentage of score weight to final score (%)
1	I	1. Understand and be able to explain the objectives and scope of areas of agrochemicals.	Ask and answer question (face-to-face). At least 5% of students in the class are able to answer the question correctly.	
2	II	2. Understand and be able to explain the atomic structure and electron configuration.	Ask and answer question (face-to-face). At least 5% of students in the class are able to answer the question correctly. Assignment.	
3	III	3. Understand and be able to explain about chemical bonds, including ionic bonds, covalent bonds, and intermolecular atomic bonds.	Ask and answer questions (face-to-face). At least 5% of students in the class are able to answer the question correctly.	

4	IV	4. Understand and be able to explain about organic chemistry, classification of organic compounds and the nomenclatures. 5. Understand and be able to explain about structures, properties and nomenclatures of chemical functional groups.	Ask and answer questions (face-to face). At least 5% of students in the class are able to answer the question correctly. Assignment.	
5	V	EVALUATION I (I-IV)		25
6	VI	6. Understand and be able to explain the molecular structure and physical properties of water and its function.	Ask and answer questions (face-to-face). Practicum 1	
7	VII	7. Understand and be able to explain the chemical properties of organic compound, including acidity, alkaline and salt. 8. Understand and be able to explain about pH, solution and indicator.	Ask and answer questions (face-to-face). Practicum 2 & 3	
8	VIII	9. Understand and be able to explain overview of carbohydrate. 10. Understand and be able to explain the molecular structures of mono-, di-, oligo and poly-saccharides	Ask and answer questions (face-to-face). Assignment. Practicum 4	
9	IX	11. Understand and be able to explain amino acids and peptides chain.	Ask and answer questions (face-to-face). Assignment	
10	X	12. Understand and be able to explain about lipid and lipid acids.	Ask and answer questions (face-to-face).	
11	XI	EVALUATION II (VI-X)		35
12	XII	13. Understand and be able to explain about stoichiometry: concentration, ppm, %, molar concept, molarity, normality.	Ask and answer questions (face-to-face). Assignment Practicum 5	
13	XIII	14. Understand and be able to explain about hydroponic nutrient solution and tissue culture media.	Ask and answer questions (face-to-face). Assignment Practicum 6 & 7	
14	XIV	15. Understand and be able to explain about soil minerals and fertilization.	Ask and answer questions (face-to-face). Assignment.	
15	XV	16. Understand and be able to explain about pesticides and the application.	Ask and answer questions (face-to-face).	
16	XVI	EVALUATION II (IX-XV)		40

### Assignment

No.	Week	Assignment Instructions	Submission Methods	Weight (%)	CLO			
					1	2	3	4
1	II	Describing the electron configuration of several elements using Lewis dot structure diagram.	Print out / submitted through e-learning	20% to total score in the Evaluation I	√			
2	IV	Describing the structures and naming organic compounds from several functional groups.	Print out / submitted through e-learning	20% to total score in the Evaluation I		√		
3	VIII	Describing the structure of some monosaccharides using both Fischer and Haworth projections.	Print out / submitted through e-learning	20% to total score in the Evaluation II			√	
4	IX	Describing and reviewing 20 essential amino acids.	Print out / submitted through e-learning	20% to total score in the Evaluation II			√	
5	XII	Calculating the concentrations of mineral solutions based on percent of concentration, molarity, and ppm formula.	Print out / submitted through e-learning	15% to total score in the Evaluation II	√			
6	XIV	Summarizing articles related to the roles of mineral nutrients on plant growth (2-3 of A4 pages).	Print out / submitted through e-learning	15% to total score in the Evaluation III		√		√
7	XV	Summarizing several media used for either hydroponics or tissue culture for plant propagation.	Print out / submitted through e-learning	15% to total score in the Evaluation III		√		√

### Laboratory Practicum

No.	Topics	Duration	CLO				Activities in Laboratory
			1	2	3	4	
1	Introduction to laboratory and equipment used for laboratory work.	170	√				Pre-test, explanation from assistant, practice according to the practical manual, writing the results in worksheet, approval by assistant.
2	Preparation of chemical solutions.	170	√				
3	Solution concentration and dilution.	170	√		√		
4	Titration and pH measurement	170	√				
5	Sample preparations for tissue analysis.	170		√	√		
6	Preparation of stock solutions for hydroponics media (Kimura B solution).	170				√	
7	Preparation of stock solutions for tissue culture (MS media).	170				√	



## Contribution of Course Assessment to PLO

Course Assessment	AV	KC	GS	SS	Type
Assignments	8, 10	1, 4	1, 2, 4	4, 10, 11	Formative
Questions in Quiz	8, 10	1, 4	1, 2, 4	4, 10, 11	Summative
Questions in Mid-Term	8, 10	1, 4	1, 2, 4	4, 10, 11	Summative
Questions in Final Exam	8, 10	1, 4	1, 2, 4	4, 10, 11	Summative
Lab Practicum	5, 7, 8, 10	1, 4	1, 2, 4, 7, 8	4, 9, 11	Formative

## Assignment Assessment Rubric

No.	Criteria	Weight (%)	Score			
			≥ 86	71-85.99	56-70.99	40-55.99
			Excellent	Good	Enough	Bad
1	Format and presentation of written assignment	10-20	The assignment is presented in accordance with the instructions	There are parts (10%) of the assignment not in accordance with the instructions	There are parts (25%) of the assignment not in accordance with the instructions	There are half of the assignment not in accordance with the instructions
2	Discussion in the written assignment	50-70	Information to support the discussion in the assignment is adequate, and the discussion is well organized	Information to support the discussion in the assignment is adequate; however the information is not well written	Information to support the discussion in the assignment is adequate; however the information is copied and pasted in the assignment without paraphrasing	There is not enough information in the assignment. It is just a compilation of information derived from internet searching
3	Publication year of literature cited in the assignment (if any)	0-15	Most of literatures cited are up-to date ( $\leq 5$ years)	Most of literatures cited are between 5-10 years	Most of literatures cited are $\geq 10$ years	There is no literature cited
4	Number of literatures cited in the assignment (if any)	0-15	There are $\geq 3$ literature cited	There are $\leq 3$ literature cited	One literature cited	There is no literature cited
5	Submission time	10	Assignment is submitted before the deadline	Assignment is submitted one day after the deadline	Assignment is submitted two days after the deadline	Assignment is submitted after two days from deadline

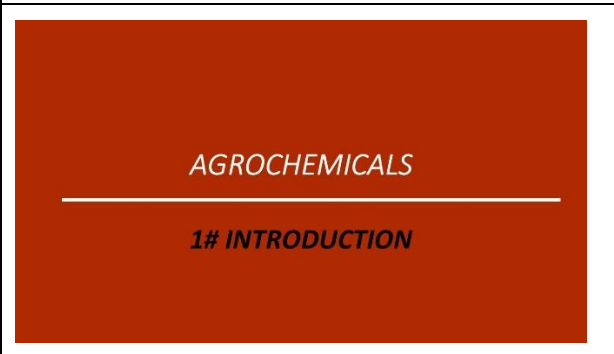
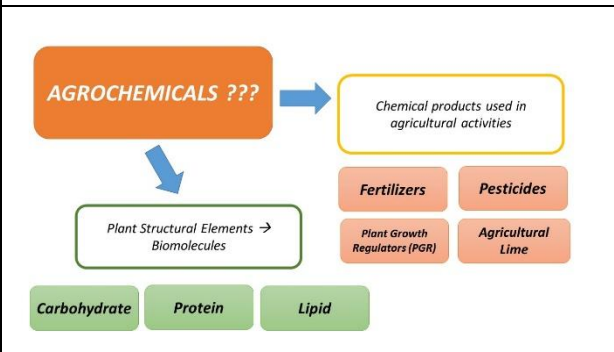

## Benchmark for Scoring

No.	Range of Score	Grade	Description
1	86.00 - 100.00	A	Excellent
2	71.00 – 85.99	B	Good
3	56.00 – 70.99	C	Fair
4	40.00 – 55.99	D	Bad
5	<40.00	E	Worst

## Remedial Exam

Students are allowed to join Remedial Exam if the score is under 60 out of 100.

## Course materials samples in Power Point Slides

Week 1	
 <p style="text-align: center;"><b>AGROCHEMICALS</b></p> <hr style="width: 30%; margin: auto;"/> <p style="text-align: center;"><b>1# INTRODUCTION</b></p>	<p style="text-align: center;"><b>COURSE OUTLINE</b></p> <hr style="width: 80%; margin: auto;"/> <ul style="list-style-type: none"> <li>• Credits : 3 (2-1) SKS</li> <li>• Lecturers : Dr. Ir. Mery Hasmeda, M.Sc., Dr. Ir. Susilawati, M.Si., Dr. Irmawati, M.Sc., M.Si., Fitra Gustiar, S.P., M.Si. &amp; Dr. Fikri Adriansyah, S.Si.</li> <li>• Schedule:             <ul style="list-style-type: none"> <li>Wed, 08.00-09.40 WIB (Indralaya Campus)</li> <li>Mon, 09.20 – 11.10 WIB (Palembang Campus)</li> </ul> </li> <li>• Tujuan Mata Kuliah :             <ul style="list-style-type: none"> <li>* Setelah mengikuti perkuliahan, mahasiswa mampu mengenal prinsip-prinsip stoikiometri dan kimia analitik: atom, molekul, ikatan kimia, gugus fungsional, air, pH, asam-basa, garam, reaksi redoks dan keseimbangan kimia, konsentrasi dan konsep molaritas, koloid, larutan elektrolit dan non elektrolit. Kimia tanah: hara tanaman, larutan dan koloid tanah, kapasitas tukar kation (KTK), pH, reaksi tanah. Pupuk kimia, pupuk tunggal dan pupuk majemuk, kapur, pupuk organik dan pupuk hayati, pestisida, herbisida, zat pengatur tumbuh</li> </ul> </li> </ul>
<p style="text-align: center;"><b>COURSE CONTENT</b></p> <hr style="width: 80%; margin: auto;"/> <ul style="list-style-type: none"> <li>• I: Overview</li> <li>• II : Atomic Structure and Electron Configuration</li> <li>• III : Chemical Bonds</li> <li>• IV : Organic chemistry: nomenclature of organic compounds &amp; functional groups</li> <li>• V : <b>Evaluation 1</b></li> <li>• VI : Structure and function of water</li> <li>• VII : Acid, alkaline and salt, pH, solution and indicator</li> <li>• VIII : Structure and function of carbohydrate</li> </ul>	<p style="text-align: center;"><b>COURSE CONTENT</b></p> <hr style="width: 80%; margin: auto;"/> <ul style="list-style-type: none"> <li>• IX : Structure and function of protein</li> <li>• X : Structure and function of lipid and lipid acids</li> <li>• XI : <b>Evaluation 2</b></li> <li>• XII : Concentration, ppm, %, molar concept, molarity, normality</li> <li>• XIII : Hydroponic nutrient solution media and tissue culture</li> <li>• XIV : Soil, nutrients and fertilization</li> <li>• XV : Pesticides and applications</li> <li>• XVI : <b>Evaluation 3</b></li> </ul>
 <p style="text-align: center;"><b>AGROCHEMICALS ???</b></p> <p style="text-align: center;">↓</p> <p style="text-align: center;">Plant Structural Elements → Biomolecules</p> <p style="text-align: center;">↓</p> <p style="text-align: center;">Carbohydrate   Protein   Lipid</p> <p style="text-align: center;">→</p> <p style="text-align: center;">Chemical products used in agricultural activities</p> <p style="text-align: center;">Fertilizers   Pesticides</p> <p style="text-align: center;">Plant Growth Regulators (PGR)   Agricultural Lime</p>	



<pre> graph TD     ELEMENT --&gt; STABLE["STABLE (2 or 8 electron valence)"]     ELEMENT --&gt; UNSTABLE["UNSTABLE (the electron valence less than 8)"]     STABLE --&gt; NOBLE_GAS["NOBLE GAS (VIII A)"]     UNSTABLE --&gt; CHEMICAL_BONDS["CHEMICAL BONDS"]     CHEMICAL_BONDS --&gt; CHEMICAL_COMPOUND["CHEMICAL COMPOUND"] </pre>	<h3>Several Types of Chemical Bonds</h3> <ol style="list-style-type: none"> <li>Atomic bonds in a molecule       <ol style="list-style-type: none"> <li>Ionic Bond</li> <li>Covalent Bond</li> </ol> </li> <li>Intermolecular atomic bonds       <ol style="list-style-type: none"> <li>Metal Bonds</li> <li>Hydrogen Bonds</li> <li>Van der Waals Bonds</li> </ol> </li> </ol>
<h3>1.a. Ionic Bond</h3> <p>"The bond that occurs due to the transfer of electrons from one atom to another." &gt;&gt;&gt; Electrovalent bond</p> <ul style="list-style-type: none"> <li>The main focus of the ionic bond model is the transfer of electrons from metal to nonmetal to form ions which then unite to form solid ionic compounds.</li> <li>Ionic bonds are formed between metal atoms which tend to lose electrons and nonmetal atoms which tend to gain electrons.</li> <li>Based on the phenomenon that occurred Lewis proposed the octet rule: "When atoms bond, they will lose, gain or share electrons to achieve the outer shell filling of 8 (or 2) electrons"</li> </ul>	<h3>OCTET RULES</h3> <ul style="list-style-type: none"> <li>The <b>octet rule</b> is a chemical rule that reflects the theory that main-group elements tend to bond in such a way that each atom has eight electrons in its valence shell, giving it the same electronic configuration as a noble gas.</li> <li>The rule is especially applicable to carbon, nitrogen, oxygen, and the halogens; although more generally the rule is applicable for the s-block and p-block of the periodic table. Other rules exist for other elements, such as the duplet rule for hydrogen and helium, or the 18-electron rule for transition metals.</li> <li>The valence electrons can be counted using a Lewis electron dot diagram.</li> </ul>
<h3>How to write the electron transfer</h3> <ol style="list-style-type: none"> <li>Electron configuration</li> <li>Orbital diagram</li> <li>Lewis dot diagram</li> </ol>	<h3>1. Electron configuration</h3> <p>11 Na = 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>1</sup>    OR 2 8 1 → release 1 electron    17 Cl = 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>2</sup> 3p<sup>5</sup>    OR 2 8 7 → receive 1 electron    &gt;&gt; Becoming NaCl</p> <p>12 Mg = 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>2</sup>    OR 2 8 2 → release 2 electron    8 O = 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>4</sup>    OR 2 6 → receive 2 electron    &gt;&gt; Becoming MgO</p> <p>13 Al = 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>2</sup> 3p<sup>1</sup>    OR 2 8 3 → release 3 electron    16 S = 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>2</sup> 3p<sup>4</sup>    OR 2 8 6 → receive 2 electron    &gt;&gt; Becoming Al<sub>2</sub>S<sub>3</sub></p>
<h3>2. Orbital diagram</h3>	<h3>3. Lewis dot diagram</h3> <ul style="list-style-type: none"> <li>In the Lewis electron dot symbol model (G.N. Lewis 1875 – 1946), the element symbol represents the nucleus and inner electrons while the surrounding dots represent the valence electrons.</li> <li>Place one point on each side (up, down, left, right), and attach the dots until all of them are used.</li> </ul>

## Sample of Student Assignment

Date		No
Date		Date
<p>Amanda Ayu Ningtyas 0507118212609 Apokarmia - Membuat struktur senyawa - anyolus</p>		
1.) 2 etil - 4 fluoro - dekana (Halida)	<p>5.) 1, 3 - dibromo - 2 - metil - Pentana (Halida)</p> $\begin{array}{c} \text{CH}_3 - \text{CH} - \text{CH} - \text{CH}_2 - \text{CH}_3 \\   \quad   \quad   \\ \text{Br} \quad \text{CH}_3 \quad \text{Br} \end{array}$	9.) Eter Heksana (Eter)
$\begin{array}{c} \text{F} \\   \\ \text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH} - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3 \\   \\ \text{CH}_2 - \text{CH}_3 \end{array}$ <p>Nama yang lebih sesuai: 4-fluoro - 2-etil dekana atau 5-fluoro - 3-metil Undekana</p>	6.) Glikol (Triol)	10.) 2, 3 - dimetil oktanal (Aldehid)
2.) Trans - 2 - butena (isomer trans)	$\begin{array}{c} \text{OH} \quad \text{OH} \quad \text{OH} \\   \quad   \quad   \\ \text{CH}_2 - \text{CH} - \text{CH}_2 \end{array}$ <p>Maka lain : 1, 2, 3 - propanetriol</p>	$\begin{array}{c} \text{CH}_3 \quad \quad \quad \text{O} \\   \quad \quad \quad    \\ \text{CH}_3 - \text{CH} - \text{CH} - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{C} - \text{H} \\   \\ \text{CH}_3 \end{array}$
3.) Asam 3, 3 - dimetil - heksanoat (Asam alkanoat)	7.) 4 - metil - 2 - oktanan (Keton)	
$\begin{array}{c} \text{CH}_3 \quad \quad \quad \text{O} \\   \quad \quad \quad    \\ \text{CH}_3 - \text{CH}_2 - \text{C} - \text{CH}_2 - \text{CH}_2 - \text{C} - \text{OH} \\   \\ \text{CH}_3 \end{array}$	$\begin{array}{c} \text{O} \\    \\ \text{CH}_3 - \text{C} - \text{CH}_2 - \text{CH} - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3 \\   \\ \text{CH}_3 \end{array}$	
4.) Cis - 3 - Heptena (isomer cis)	8.) Etil - 2 - metil Pentanoat (Ester)	
$\begin{array}{c} \text{H} \quad \quad \quad \text{H} \\   \quad \quad \quad   \\ \text{C} = \text{C} \\   \quad \quad \quad   \\ \text{CH}_3 - \text{CH}_2 \quad \quad \quad \text{CH}_2 - \text{CH}_2 - \text{CH}_3 \end{array}$	$\begin{array}{c} \text{O} \\    \\ \text{CH}_3 - \text{C} - \text{CH}_2 - \text{CH} - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3 \\   \\ \text{CH}_3 \end{array}$	

## Sample of Student Exam

<p>DEVITA MUSTIKA WULANDARI</p> <p>Started on Friday, 15 October 2021, 8:03 AM</p> <p>State Finished</p> <p>Completed on Friday, 15 October 2021, 8:33 AM</p> <p>Time taken 29 mins 57 secs</p> <p>Grade 90.00 out of 100.00</p>	
<p><b>Question 1</b> Correct Mark 5.00 out of 5.00</p> <p>Jenis karbohidrat yang merupakan gabungan antara glukosa dan fruktosa adalah</p> <p><input checked="" type="radio"/> a. Sukrosa</p> <p><input type="radio"/> b. Maltosa</p> <p><input type="radio"/> c. Raffinosa</p> <p><input type="radio"/> d. Selubiosa</p> <p>Your answer is correct. The correct answer is: Sukrosa</p>	<p><b>Question 2</b> Correct Mark 5.00 out of 5.00</p> <p>Persentase kandungan bahan aktif suatu pestisida yang terdapat dalam larutan jadi disebut dengan .....</p> <p><input checked="" type="radio"/> a. Konsentrasi bahan aktif</p> <p><input type="radio"/> b. Konsentrasi larutan</p> <p><input type="radio"/> c. Konsentrasi pelarut</p> <p><input type="radio"/> d. Konsentrasi formulasi</p> <p>Your answer is correct. The correct answer is: Konsentrasi bahan aktif</p>
<p><b>Question 3</b> Correct Mark 5.00 out of 5.00</p> <p>Di bawah ini yang merupakan jenis monosakarida yang paling sederhana adalah</p> <p><input type="radio"/> a. Ribosa</p> <p><input type="radio"/> b. Glukosa</p> <p><input type="radio"/> c. Ribulosa</p> <p><input checked="" type="radio"/> d. Dihidroksiaseton</p> <p>Your answer is correct. The correct answer is: Dihidroksiaseton</p>	<p><b>Question 4</b> Incorrect Mark 0.00 out of 5.00</p> <p>Asam lemak berikut yang tidak memiliki ikatan rangkap yaitu .....</p> <p><input type="radio"/> a. Asam linolenat</p> <p><input type="radio"/> b. Asam oleat</p> <p><input checked="" type="radio"/> c. Asam linoleat</p> <p><input type="radio"/> d. Asam stearat</p> <p>Your answer is incorrect. The correct answer is: Asam stearat</p>



<p><b>Question 5</b> Correct Mark 5.00 out of 5.00</p> <p>Pupuk Urea merupakan jenis pupuk tunggal yang mengandung unsur .....</p> <p><input type="radio"/> a. Kalium</p> <p><input type="radio"/> b. Fosfor</p> <p><input type="radio"/> c. Magnesium</p> <p><input checked="" type="radio"/> d. Nitrogen ✓</p> <p>Your answer is correct. The correct answer is: Nitrogen</p>	<p><b>Question 6</b> Correct Mark 5.00 out of 5.00</p> <p>Maksud penggunaan "omega" pada struktur asam lemak adalah .....</p> <p><input checked="" type="radio"/> a. Menunjukkan letak ikatan rangkap pertama pada rantai karbon ✓</p> <p><input type="radio"/> b. Menunjukkan tingkat ketidaksaturan</p> <p><input type="radio"/> c. Menunjukkan jumlah atom karbon</p> <p><input type="radio"/> d. Menunjukkan jumlah ikatan rangkap</p> <p>Your answer is correct. The correct answer is: Menunjukkan letak ikatan rangkap pertama pada rantai karbon</p>
<p><b>Question 7</b> Correct Mark 5.00 out of 5.00</p> <p>Jenis pestisida berikut yang dapat digunakan untuk membasmikan gulma pengganggu tanaman yaitu .....</p> <p><input type="radio"/> a. Fungisida</p> <p><input checked="" type="radio"/> b. Herbisida ✓</p> <p><input type="radio"/> c. Akarisida</p> <p><input type="radio"/> d. Rodentisida</p> <p>Your answer is correct. The correct answer is: Herbisida</p>	<p><b>Question 8</b> Correct Mark 5.00 out of 5.00</p> <p>Yang merupakan monomer dari protein adalah ....</p> <p><input type="radio"/> a. Gliserol</p> <p><input checked="" type="radio"/> b. Asam amino ✓</p> <p><input type="radio"/> c. Glukosa</p> <p><input type="radio"/> d. Monosakarida</p> <p>Your answer is correct. The correct answer is: Asam amino</p>
<p><b>Question 9</b> Correct Mark 5.00 out of 5.00</p> <p>Salah satu faktor yang menyebabkan berkurangnya jumlah unsur hara di dalam tanah atau media tanam adalah .....</p> <p><input type="radio"/> a. Populasi tanaman yang terlalu rapat</p> <p><input type="radio"/> b. Akar tanaman dapat menyerap unsur hara secara efisien</p> <p><input type="radio"/> c. Terdapat unsur hara makro dan mikro di dalam tanah</p> <p><input checked="" type="radio"/> d. Terjadinya pencucian unsur hara ✓</p> <p>Your answer is correct. The correct answer is: Terjadinya pencucian unsur hara</p>	<p><b>Question 10</b> Incorrect Mark 0.00 out of 5.00</p> <p>Berikut ini yang bukan termasuk sebagai lemak sederhana adalah .....</p> <p><input type="radio"/> a. Asam lemak</p> <p><input type="radio"/> b. Kolesterol</p> <p><input checked="" type="radio"/> c. Lilin ✗</p> <p><input type="radio"/> d. Lemak</p> <p>Your answer is incorrect. The correct answer is: Kolesterol</p>
<p><b>Question 11</b> Correct Mark 5.00 out of 5.00</p> <p>Berikut merupakan faktor yang mempengaruhi volume semprot pestisida, kecuali .....</p> <p><input type="radio"/> a. Jarak tanam</p> <p><input type="radio"/> b. Alat yang digunakan</p> <p><input checked="" type="radio"/> c. Jenis pestisida yang digunakan ✓</p> <p><input type="radio"/> d. Fase pertumbuhan dan perkembangan tanaman</p> <p>Your answer is correct. The correct answer is: jenis pestisida yang digunakan</p>	<p><b>Question 12</b> Correct Mark 5.00 out of 5.00</p> <p>Salah satu contoh hama yang dapat dibasmi dengan menggunakan insektisida adalah .....</p> <p><input type="radio"/> a. Tikus</p> <p><input type="radio"/> b. Burung</p> <p><input checked="" type="radio"/> c. Belalang ✓</p> <p><input type="radio"/> d. Keong</p> <p>Your answer is correct. The correct answer is: Belalang</p>
<p><b>Question 13</b> Correct Mark 5.00 out of 5.00</p> <p>Yang dimaksud dengan defisiensi unsur hara pada tanaman adalah .....</p> <p><input type="radio"/> a. Tanaman mendapatkan suplai hara yang berlebihan sehingga justru menyebabkan keracunan</p> <p><input checked="" type="radio"/> b. Tidak terpenuhinya kebutuhan unsur hara pada tanaman ✓</p> <p><input type="radio"/> c. Tanaman tidak mampu menyerap unsur hara yang ada di dalam tanah</p> <p><input type="radio"/> d. Unsur hara yang ada di dalam tanah hilang akibat adanya penguapan</p> <p>Your answer is correct. The correct answer is: Tidak terpenuhinya kebutuhan unsur hara pada tanaman</p>	<p><b>Question 14</b> Correct Mark 5.00 out of 5.00</p> <p>Pupuk yang mengandung dua atau lebih unsur hara penting bagi tanaman disebut dengan .....</p> <p><input type="radio"/> a. Pupuk cair</p> <p><input type="radio"/> b. Pupuk organik</p> <p><input checked="" type="radio"/> c. Pupuk majemuk ✓</p> <p><input type="radio"/> d. Pupuk tunggal</p> <p>Your answer is correct. The correct answer is: Pupuk majemuk</p>

<p><b>Question 15</b> Correct Mark 5.00 out of 5.00</p> <p>Ikatan yang menggabungkan dua monosakarida disebut dengan ikatan .....</p> <p> <input type="radio"/> a. Peptida  <input type="radio"/> b. Ionik  <input checked="" type="radio"/> c. Glikosida  <input type="radio"/> d. Esterifikasi         </p> <p>Your answer is correct. The correct answer is: Glikosida</p>	<p><b>Question 16</b> Correct Mark 5.00 out of 5.00</p> <p>Bagian dari pati yang strukturnya memiliki rantai cabang adalah .....</p> <p> <input type="radio"/> a. Gliserol  <input checked="" type="radio"/> b. Amilopektin  <input type="radio"/> c. Glikogen  <input type="radio"/> d. Amilosa         </p> <p>Your answer is correct. The correct answer is: Amilopektin</p>
<p><b>Question 17</b> Correct Mark 5.00 out of 5.00</p> <p>Yang merupakan monomer dari lemak adalah .....</p> <p> <input type="radio"/> a. Glukosa dan fruktosa  <input type="radio"/> b. Gliserol dan lilin  <input type="radio"/> c. Lilin dan asam lemak  <input checked="" type="radio"/> d. Gliserol dan asam lemak         </p> <p>Your answer is correct. The correct answer is: Gliserol dan asam lemak</p>	<p><b>Question 18</b> Correct Mark 5.00 out of 5.00</p> <p>Asam amino berikut yang terdapat unsur S pada strukturnya adalah .....</p> <p> <input type="radio"/> a. Isoleusin  <input checked="" type="radio"/> b. Methionin  <input type="radio"/> c. Fenilalanin  <input type="radio"/> d. Histidin         </p> <p>Your answer is correct. The correct answer is: Methionin</p>
<p><b>Question 19</b> Correct Mark 5.00 out of 5.00</p> <p>Berikut ini merupakan faktor-faktor yang mempengaruhi efektifitas aplikasi pestida di lapangan, kecuali .....</p> <p> <input type="radio"/> a. Aplikasi pestisida sesuai dengan dosis anjuran  <input checked="" type="radio"/> b. Aplikasi pestida harus dilakukan dengan frekuensi yang rapat  <input type="radio"/> c. Aplikasi pestisida dilakukan pada waktu yang tepat  <input type="radio"/> d. Pestisida yang digunakan sesuai dengan jenis sasaran         </p> <p>Your answer is correct. The correct answer is: Aplikasi pestida harus dilakukan dengan frekuensi yang rapat</p>	<p><b>Question 20</b> Correct Mark 5.00 out of 5.00</p> <p>Jenis lipid yang mengandung protein disebut dengan .....</p> <p> <input type="radio"/> a. Fosfolipid  <input type="radio"/> b. Sulfolipid  <input checked="" type="radio"/> c. Lipoprotein  <input type="radio"/> d. Glikolipid         </p> <p>Your answer is correct. The correct answer is: Lipoprotein</p>

## Achievement of CLO (Indralaya Class)

STUDY PROGRAM :        INDRALAYA CLASS  
 ACADEMIC YEAR :       2021/2022 (ODD SEMESTER)  
 COURSE :                AGROCHEMICALS (3 CREDITS)  
 ROOM :                  RK C1101  
 SCHEDULE :             WEDNESDAY (07:30 - 09:10 WIB)

NO.	NIM	NAMA	EV 1	EV 2	EV 3	FINAL SCORE	GRADE	OVERALL ASSESSMENT
1	05071182126001	SYA'BANI ZUHRI	100,00	95,00	75,00	88,25	A	Achieved
2	05071182126002	CUCI CAHYANI	100,00	80,00	83,00	86,20	A	Achieved
3	05071182126003	M.IRSAL FARRAS	100,00	90,00	83,00	89,70	A	Achieved
4	05071182126004	ROSKA NOPRI ARDI	93,00	90,00	79,00	86,35	A	Achieved
5	05071182126005	DEVITA MUSTIKA WULANDARI	100,00	92,50	87,00	92,18	A	Achieved
6	05071182126006	MELIANI SULISTA	100,00	87,50	78,00	86,83	A	Achieved
7	05071182126007	DEA FEBRIYANTI	100,00	80,00	83,00	86,20	A	Achieved
8	05071182126008	KHAIRUM RIZKIYA	100,00	87,50	63,00	80,83	B	Not Achieved
9	05071182126009	AMANDA AYU NINGTYAS	100,00	92,50	75,00	87,38	A	Achieved
10	05071182126011	SRI WAHYUDI	100,00	85,00	79,00	86,35	A	Achieved
11	05071182126014	MEY LINDA AIRIYANI	93,00	95,00	79,00	88,10	A	Achieved
12	05071182126015	JERRY AGUS WIBOWO	100,00	92,50	79,00	88,98	A	Achieved
13	05071182126016	YITRO LASROHA SITUMORANG	93,00	82,50	85,00	86,13	A	Achieved
14	05071182126017	DIAN WAHYU SAMUDRA BERAMPU	87,00	87,50	85,00	86,38	A	Achieved
15	05071281823031	RAINHARD SAKTIADJI TARIGAN	100,00	90,00	79,00	88,10	A	Achieved
16	05071281823077	PUTRA TRISUTRISNO HUTABARAT	100,00	85,00	63,00	79,95	B	Not Achieved
17	05071282126018	SYIFA NUR HIZATI	100,00	87,50	79,00	87,23	A	Achieved
18	05071282126019	SALSABILLA	100,00	85,00	80,00	86,75	A	Achieved
19	05071282126020	M.YASKUR NASIR	100,00	90,00	91,00	92,90	A	Achieved
20	05071282126021	ANGGITA PUTRI	100,00	87,50	79,00	87,23	A	Achieved
21	05071282126022	BERLI AMELIA	100,00	90,00	83,00	89,70	A	Achieved
22	05071282126023	SYAHRIL MARENDRA	100,00	80,00	83,00	86,20	A	Achieved
23	05071282126024	VALENCIA DJOHARI	93,00	82,50	63,00	77,33	B	Not Achieved
24	05071282126025	MUHAMMAD ILHAM ADITYA NUGRAHA	93,00	87,50	95,00	91,88	A	Achieved
25	05071282126026	MUHAMMAD RIZKY WASKITO	100,00	87,50	80,00	87,63	A	Achieved
26	05071282126027	DEBBI SETYA WINAWUNG	100,00	92,50	83,00	90,58	A	Achieved
27	05071282126029	NORIS RAHMADONA	100,00	80,00	83,00	86,20	A	Achieved
28	05071282126030	MELINA MUNAWAROH	100,00	75,00	71,00	79,65	B	Not Achieved
29	05071282126031	RINTO FITRAH YADI	100,00	87,50	78,00	86,83	A	Achieved
30	05071282126032	RAVELA MARSELLY	100,00	92,50	83,00	90,58	A	Achieved
31	05071282126033	INDRA WIJAYA	100,00	92,50	79,00	88,98	A	Achieved
32	05071282126034	FAZLE MAWLA PURNOMO	93,00	92,50	78,00	86,83	A	Achieved
33	05071282126035	ARIF RIZKY DARMAWAN	100,00	92,50	83,00	90,58	A	Achieved
34	05071282126036	YULINA ADELINA NAINGGOLAN	100,00	95,00	87,00	93,05	A	Achieved
35	05071282126037	GOPI ADRIAN DAOMARA UJUNG	100,00	92,50	79,00	88,98	A	Achieved
36	05071282126038	KRISNA UKTI	100,00	75,00	71,00	79,65	B	Not Achieved
37	05071282126039	JUAN FARREL JAMASREN SARAGIH SUMBAYAK	100,00	87,50	87,00	90,43	A	Achieved
38	05071282126040	TUKKOT PAKPAHAN	100,00	87,50	79,00	87,23	A	Achieved
39	05071282126041	ARYANDA PRADANA	100,00	95,00	71,00	86,65	A	Achieved
40	05071282126042	DUWI SEPTIANI	100,00	85,00	67,00	81,55	B	Not Achieved
41	05071282126043	SIHOL SUGANDA TAMBA	100,00	90,00	75,00	86,50	A	Achieved
42	05071282126044	ZALFA QANITA	100,00	95,00	91,00	94,65	A	Achieved
43	05071282126045	SITI NURHALIZA	100,00	85,00	91,00	91,15	A	Achieved
44	05071282126046	ILHAM SAZILI	100,00	87,50	78,00	86,83	A	Achieved
45	05071282126047	KHARISMA PUTRI UTAMI	100,00	95,00	79,00	89,85	A	Achieved
46	05071282126048	ANDRIANSYA	100,00	92,50	75,00	87,38	A	Achieved
47	05071282126049	RISA EMELIA RAMATHA SIANIPAR	93,00	77,50	79,00	81,98	B	Not Achieved
48	05071282126050	LISA AMELIA	100,00	80,00	71,00	81,40	B	Not Achieved
49	05071282126051	MASKHURI	93,00	92,50	79,00	87,23	A	Achieved
50	05071282126052	AYUB AFRIANDI	100,00	65,00	71,00	76,15	B	Not Achieved
51	05071282126053	DIAN LESTARI	100,00	85,00	67,00	81,55	B	Not Achieved
52	05071282126054	FELIX WIBOWO PANJAITAN	93,00	92,50	78,00	86,83	A	Achieved
53	05071282126056	ZAKI MUMTAZ ABIYU	93,00	87,50	83,00	87,08	A	Achieved
54	05071282126057	RINI EMELIA WIJAYA	100,00	92,50	79,00	88,98	A	Achieved
55	05071282126058	ANGELICA RAULIMA SINAGA	100,00	92,50	83,00	90,58	A	Achieved
56	05071282126059	MUHAMMAD RIZKI APRIYANSYAH	70,00	82,50	71,00	74,78	B	Not Achieved
57	05071282126060	ARI TAUFIK HIDAYAT	100,00	92,50	75,00	87,38	A	Achieved
58	05071282126061	SRI RAHMA WATI	100,00	77,50	85,00	86,13	A	Achieved
59	05071282126062	ADE ENINTA BR BARUS	100,00	85,00	87,00	89,55	A	Achieved
60	05071282126063	MUHAMAD HANIF HAWARI	100,00	75,00	71,00	79,65	B	Not Achieved
61	05071282126064	SABINA NASYWA AZZAHRA PAKHLEVIE	100,00	87,50	83,00	88,83	A	Achieved
62	05071282126065	MUHAMMAD RIZKI AL-QADHAR	100,00	90,00	87,00	91,30	A	Achieved
63	05071282126066	EMIYA LIVIANI SITEPU	100,00	92,50	75,00	87,38	A	Achieved
64	05071282126068	SISKA YULINDA SARI	100,00	95,00	79,00	89,85	A	Achieved
		<b>AVERAGE PER CLASS</b>	<b>98,23</b>	<b>87,50</b>	<b>79,05</b>	<b>86,80</b>		
		<b>ACHIEVEMENT</b>	<b>Achieved</b>	<b>Achieved</b>	<b>Not Achieved</b>	<b>Achieved</b>		



### Achievement of CLO (Palembang Class)

STUDY PROGRAM : PALEMBANG CLASS  
 ACADEMIC YEAR : 2021/2022 (ODD SEMESTER)  
 COURSE : AGROCHEMICALS (3 CREDITS)  
 ROOM : ROOM 08  
 SCHEDULE : WEDNESDAY (07:30 - 09:10 WIB)

NO.	NIM	NAMA	EV 1	EV 2	EV 3	FINAL SCORE	GRADE	OVERALL ASESSMENT
1	05091382126066	AANG WINARTA	85	71,5	63	71,48	B	Not Achieved
2	05091382126067	MEIHUA PUTRI UTAMI	93	73,9	78	80,32	B	Not Achieved
3	05091382126068	GEDE ARIE SWITE	93	70,3	84	81,46	B	Not Achieved
4	05091382126070	INTAN PUTRI KIRANA	93	77,5	78	81,58	B	Not Achieved
5	05091382126074	DITA PUTRI ANJELYNA	100	81,1	82	86,19	A	Achieved
6	05091382126075	MAHESAH	93	76,3	74	79,56	B	Not Achieved
7	05091382126077	HELEN	93	83,5	80	84,48	B	Not Achieved
8	05091382126079	I PUTU SATRIA JAYA ARJUN SAPUTRA	43	82,3	0	39,56	E	Not Achieved
9	05091382126082	AL HUSAIRI	68	76,3	78	74,91	B	Not Achieved
10	05091382126084	WAHYU EKO SYAPUTRA	100	76,3	74	81,31	B	Not Achieved
11	05091382126085	M.AIRLANGGA PRAYUDHA	87	76,3	72	77,26	B	Not Achieved
12	05091382126086	KHARISMA DARMAWANGSYAH	100	72,7	72	79,25	B	Not Achieved
13	05091382126087	MUHAMMAD OKTA PATRIO PUTRA	93	75,1	74	79,14	B	Not Achieved
14	05091382126088	SALSABILLA NAJRI	87	85,7	86	86,15	A	Achieved
15	05091382126090	YOLANDA SUTRISNO	60	71,5	78	71,23	B	Not Achieved
16	05091382126092	ANGGELITA VANESA VIOLINA	75	78,7	82	79,10	B	Not Achieved
		<b>AVERAGE PER CLASS</b>	<b>85,19</b>	<b>76,81</b>	<b>72,19</b>	<b>77,06</b>		
		<b>ACHIEVEMENT</b>	<b>achieved</b>	<b>not achieved</b>	<b>not achieved</b>	<b>not achieved</b>		

### Percentage of CLO Achievement (Indralaya Class)

No.	Evaluation	Max. Score	Score	CLO1	CLO2	CLO3	CLO4
1	Evaluation 1	100	98.23	√	√		
2	Evaluation 2	100	87.50		√	√	
3	Evaluation 3	100	79.05		√		√
	<b>Total</b>	300	264.78	98.23	264.78	87.50	79.05
				98.23	88.26	87.50	79.05
	<b>Minimum achievement is 80</b>			√	√	√	x

### Percentage of CLO Achievement (Palembang Class)

No.	Evaluation	Max. Score	Score	CLO1	CLO2	CLO3	CLO4
1	Evaluation 1	100	85.19	√	√		
2	Evaluation 2	100	76.81		√	√	
3	Evaluation 3	100	72.19		√		√
	<b>Total</b>	300	234.19	85.19	234.19	76.81	72.19
				85.19	78.06	76.81	72.19
	<b>Minimum achievement is 80</b>			√	x	x	x



KEMENTERIAN RISET, TEKNOLOGI DAN PENDIDIKAN TINGGI  
UNIVERSITAS SRIWIJAYA  
FAKULTAS PERTANIAN  
PROGRAM STUDI AGRONOMI  
Jalan Palembang-Prabumulih Km.32 Indralaya Ogan Ilir Sumatera Selatan  
Telpon :0711580059; Fax

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## RENCANA PEMBELAJARAN SEMESTER

Fakultas/Jurusan : Pertanian/ Budidaya Pertanian  
Matakuliah : Agrokimia  
Kode/SKS : PAG 101116 / 3 SKS (2-1)  
Semester : Ganjil  
Dosen Pengampu : Dr. Ir. Mery Hasmeda, M.Sc., Dr. Ir. Susilawati, M.Si., Dr. Irmawati, S.P., M.Si., M.Sc., Fitra Gustiar, S.P., M.Si., Dr. Fikri Adriansyah, S.Si.

### Deskripsi Mata Kuliah:

Mata kuliah ini merupakan pengantar untuk kimia pertanian terkait prinsip-prinsip stoikhiometri dan kimia analitik; atom, molekul, ikatan kimia, gugus fungsional, air, pH, asam-basa, garam, reaksi redoks dan keseimbangan kimia, konsentrasi dan konsep molaritas, koloid, larutan elektrolit dan non elektrolit. Kimia tanah: hara tanaman, larutan dan koloid tanah, kapasitas tukar kation (KTK), pH, reaksi tanah. Pupuk kimia, pupuk tunggal dan pupuk majemuk, kapur, pupuk organik dan pupuk hayati, pestisida, herbisida, zat pengatur tumbuh.

### Capaian Pembelajaran Mata Kuliah:

1	Memahami struktur atom dan konfigurasi elektron
2	Memahami ikatan kimia dan kimia organik
3	Memahami struktur dan fungsi air
4	Memahami konsep asam, basa dan garam
5	Memahami pH, larutan dan indikator

6	Memahami struktur dan fungsi dari karbohidrat, protein, dan lemak
7	Memahami konsentrasi dan konsep molaritas
8	Memahami proses pembuatan media larutan hidroponik dan kultur jaringan
9	Memahami unsur hara tanaman, jenis pupuk dan teknik pemupukan
10	Memahami pestisida dan aplikasinya

Minggu ke	Kemampuan Akhir	Bahan Kajian Pembelajaran	Metode Pembelajaran	Pengalaman Belajar	Penilaian			Waktu Pembelajaran
					Indikator	Teknik Penilaian	Bobot (%)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	Mahasiswa mampu: memahami garis besar mata kuliah; dan kontrak perkuliahan	1.1 Penjelasan RPS 1.2 Kontrak Perkuliahan	Ceramah dan tanya jawab	1. Mendiskusikan isi handout terkait rencana pembelajaran semester meliputi tugas, kuis dan evaluasi pembelajaran	1. Keaktifan dalam diskusi 2. Pendapat dan gagasan logis 3. Kemampuan menyampaikan pendapat dan gagasan			
1	Memahami struktur atom dan konfigurasi elektron	1.1 Struktur atom 1.2 Konfigurasi elektron	Ceramah, diskusi dan tanya jawab	1. Mengikuti presentasi dosen tentang struktur atom dan konfigurasi elektron 2. Membaca handout berkenaan dengan struktur atom dan konfigurasi elektron	1. Keaktifan dalam diskusi 2. Pendapat dan gagasan logis 3. Kemampuan menyampaikan pendapat dan gagasan	1. Tes lisan 2. Tes tertulis	5%	100 menit
2	Memahami ikatan kimia	2.1 Ikatan ionik 2.2 Ikatan kovalen 2.3. Ikatan atom antar molekul	Ceramah, diskusi dan tanya jawab	1. Mengikuti presentasi dosen tentang ikatan kimia 2. Membaca handout mengenai ikatan kimia 3. Berdiskusi isi handout mengenai ikatan kimia	1. Keaktifan dalam diskusi 2. Pendapat dan gagasan logis 3. Kemampuan menyampaikan pendapat dan gagasan	1. Tes lisan 2. Tes tertulis	5%	100 menit
3	Memahami kimia organik	3.1 Tata nama senyawa organik 3.2 Gugus Fungsional	Ceramah, diskusi dan tanya jawab	1. Mengikuti presentasi dosen tentang kimia organik 2. Membaca handout tentang	1. Keaktifan dalam diskusi 2. Pendapat dan gagasan logis 3. Kemampuan	1. Tes lisan 2. Tes tertulis	10%	100 menit

				kimia organik	berkomunikasi			
4	Memahami struktur dan fungsi air	4.1 Struktur air 4.2 Fungsi air pada tanaman	Ceramah, diskusi dan tanya jawab	1. Mengikuti presentasi dosen tentang struktur dan fungsi air 2. Membaca handout tentang struktur dan fungsi air	1. Keaktifan dalam diskusi 2. Pendapat dan gagasan logis 3. Kemampuan berkomunikasi	1. Tes lisan 2. Tes tertulis	10%	100 menit
5	Memahami asam, basa dan garam	5.1 Asam 5.2 Basa 5.3 Garam	Ceramah, diskusi dan tanya jawab	1. Mengikuti presentasi dosen tentang asam, basa dan garam 2. Membaca handout mengenai asam, basa, dan garam	1. Keaktifan dalam diskusi 2. Pendapat dan gagasan logis 3. Kemampuan berkomunikasi	1. Tes lisan 2. Tes tertulis	5%	100 menit
6	Memahami pH, larutan, dan indikator	6.1 pH 6.2 Larutan 6.3 Indikator	Ceramah, diskusi dan tanya jawab	1. Mengikuti presentasi dosen tentang pH, larutan dan indikator 2. Membaca handout Mengenai pH, larutan dan indikator	1. Keaktifan dalam diskusi 2. Pendapat dan gagasan logis 3. Kemampuan berkomunikasi	1. Tes lisan 2. Tes tertulis	5%	100 menit
7	Memahami struktur dan fungsi karbohidrat	7.1 Struktur karbohidrat 7.2 Fungsi karbohidrat	Ceramah, diskusi dan tanya jawab	1. Mengikuti presentasi dosen tentang karbohidrat 2. Membaca handout mengenai karbohidrat	1. Keaktifan dalam diskusi 2. Pendapat dan gagasan logis 3. Kemampuan berkomunikasi	1. Tes lisan 2. Tes tertulis	5%	100 menit
8	UTS (Materi minggu 1-7)							
9	Memahami struktur dan fungsi protein	9.1 Struktur protein 9.2 Fungsi protein	Ceramah, diskusi dan tanya jawab	1. Mengikuti presentasi dosen tentang protein 2. Membaca handout mengenai protein	1. Keaktifan dalam diskusi 2. Pendapat dan gagasan logis 3. Kemampuan berkomunikasi	1. Tes lisan 2. Tes tertulis	5%	100 menit
10	Memahami struktur dan fungsi lemak	10.1 Struktur asam lemak dan lemak 10.2 Fungsi asam lemak dan lemak	Ceramah, diskusi dan tanya jawab	1. Mengikuti presentasi dosen tentang lemak 2. Membaca handout mengenai lemak	1. Keaktifan dalam diskusi 2. Pendapat dan gagasan logis 3. Kemampuan	1. Tes lisan 2. Tes tertulis	5%	100 menit

					berkomunikasi			
11	Memahami konsentrasi dan konsep molaritas	11.1 Konsentrasi larutan 11.2. ppm dan % 11.3. Molar, molaritas, normalitas	Ceramah, diskusi dan tanya jawab	1. Mengikuti presentasi dosen tentang konsentrasi dan konsep molaritas 2. Membaca handout tentang konsentrasi dan konsep molaritas	1. Keaktifan dalam diskusi 2. Pendapat dan gagasan logis 3. Kemampuan menyampaikan pendapat dan gagasan	1. Tes lisan 2. Tes tertulis	10%	100 menit
12	Memahami pembuatan media larutan hara hidroponik dan kultur jaringan	12.1. Media larutan hara hidroponik 12.2. Media kultur jaringan	Ceramah, diskusi dan tanya jawab	1. Mengikuti presentasi dosen tentang media hidroponik dan kultur jaringan 2. Mendiskusikan isi handout tentang media hidroponik dan kultur jaringan	1. Keaktifan dalam diskusi 2. Pendapat dan gagasan logis 3. Kemampuan menyampaikan pendapat dan gagasan 4. Kemampuan menjawab pertanyaan	1. Tes lisan 2. Tes tertulis	10%	100 menit
13	Memahami unsur hara dan jenis pupuk	13.1. Unsur hara tanaman 13.2. Jenis pupuk	Ceramah, diskusi dan tanya jawab	1. Mengikuti presentasi dosen tentang unsur hara dan jenis pupuk 2. Mendiskusikan isi handout tentang unsur hara dan jenis pupuk	1. Keaktifan dalam diskusi 2. Pendapat dan gagasan logis 3. Kemampuan menyampaikan pendapat dan gagasan 4. Kemampuan menjawab pertanyaan	1. Tes lisan 2. Tes tertulis	5%	100 menit
14	Memahami tanah, unsur hara dan pemupukan	14.1. Kesuburan tanah 14.2 Teknik pemupukan	Ceramah, diskusi dan tanya jawab	1. Mengikuti presentasi dosen tentang tanah dan teknik pemupukan 2. Mendiskusikan isi handout tentang	1. Keaktifan dalam diskusi 2. Pendapat dan gagasan logis 3. Kemampuan menyampaikan pendapat dan	1. Tes lisan 2. Tes tertulis	10%	100 menit

				tanah dan teknik pemupukan	gagasan			
15	Memahami pestisida dan aplikasinya	15.1. Jenis pestisida 15.2. Aplikasi pestida	Ceramah, diskusi dan tanya jawab	1. Mengikuti presentasi dosen tentang pestisida dan teknik aplikasinya 2. Mendiskusikan isi handout tentang pestisida dan teknik aplikasinya	1. Keaktifan dalam diskusi 2. Pendapat dan gagasan logis 3. Kemampuan menyampaikan pendapat dan gagasan	1. Tes lisan 2. Tes tertulis	10%	100 menit
16	UJIAN SEMESTER (materi minggu ke 9-15)							