

# **PORTFOLIO**

## **Metabolism and Pathways of Genetics Information**

**ACADEMIC YEAR 2019/2020 EVEN SEMESTER**



**Course Coordinator:**  
**Prof. Dr. Lenny Yuanita, M.Kes.**

**Teaching Team:**  
**Prof. Dr. Rudiana Agustini, M.Pd**  
**Dr. Prima Retno Wikandari, M.Si**  
**Dr. Nuniek Herdyastuti, M.Si**  
**Mirwa Adi Prahara, M.Si**

**CHEMISTRY DEPARTMENT**  
**FACULTY OF MATHEMATICS AND SCIENCE**  
**UNIVERSITAS NEGERI SURABAYA**

## TABLE OF CONTENT

A.	SEMESTER LEARNING ACTIVITY PLAN	3
A.1.	COURSE IDENTITY	3
A.2.	COURSE TOPIC	5
A.3.	COURSE PROGRAM	6
A.4.	MAPPING OF LEARNING OUTCOMES – COURSE OUTCOMES	13
A.4.1.	The Expected Program Learning Outcomes (PLO) of Undergraduate Program of Education Chemistry (UPCE)	13
A.4.2.	The Education Program Objectives (PEOs) of Metabolism and Pathways of Genetic Information	14
A.4.3.	Mapping of Program Learning Outcomes (PLO) – Education Program Objectives (PEOs)	14
B.	COURSE ASSESSMENT	14
B.1.	ASSESSMENT RUBRIC	14
B.2.	ASSESSMENT SYSTEM	14
C.	COURSE DEVELOPMENT	15
C.1.	ACADEMIC YEAR 2019/2020 RESULT	15
C.2.	PROBLEM ANALYSIS	15
C.3.	SOLUTIVE STRATEGY	15
D.	APPENDICES	
D.1.	DOCUMENT OF COURSE ACTIVITY	16
D.1.1.	Lecture’s journal and student’s attendance form <a href="http://siakadu.uneca.ac.id">siakadu.uneca.ac.id</a>	16
D.1.2.	Sample of statement of examination official report	17
D.2.	SAMPLE OF STUDENT WORK	18
D.2.1.	Sample of Test Paper	19
D.2.2.	Sample of Student’s Work	20
D.3.	RECAPITULATION OF ASSESSMENT	23
D.3.1.	Validate Test Item	23
D.3.2.	Evaluation Results of Metabolism and Pathways of Genetic Information	23
D.3.3.	Percentage of PLO achievements of Metabolism and Pathways of Genetic Information at Academic Year 2019/2020	24

## A. SEMESTER LEARNING ACTIYITY PLAN

### A.1. COURSE IDENTITY

Module Name	Metabolism and Pathways of Genetics Information
Module level	Bachelor
Abbreviation, if applicable	8420403034
Sub-heading, if applicable	-
Course included in the module, if applicable	-
Semester/term	6 <sup>st</sup> /Third Year
Module coordinator(s)	Prof. Dr. Lenny Yuanita, M.Kes
Lecturer(s)	Prof. Dr. Rudiana Agustini, M.Pd ; Dr. Prima Retno Wikandari, M.Si ; Dr. Nuniek Herdyastuti, M.Si, ; Mirwa Adi Prahara, M.Si
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:	1 CU for bachelor degree equals to 3 workhours per week or 170 minutes (50' face to face learning, 60' structured learning, and 60' independent learning). In one semester, courses are conducted in 14 weeks (excluding mid and end-term exam). Thus, 1 CU equals to 39.67 workhours per semester. One CU equals to 1.587 ECTS.
Credit points:	3 SCU (4,761)
Prerequisites course(s):	-
Targeted learning outcomes:	<ol style="list-style-type: none"><li>1. Able to solve the problem of SCIENCE IN GENERAL CHEMISTRY and in simple spheres such as identification, analysis, isolation, transformation, and synthesis of micromolecules, through the application of structures, properties, molecular changes, energy and kinetics</li><li>2. Able to solve the science and technology in the field of biochemistry, especially related to metabolism and processing of genetic information, based on the study of science and methods of analysis and synthesis, as well as the application of relevant technologies.</li><li>3. Have knowledge of : a) metabolism and regulation of biomolecules of carbohydrates, lipides, and proteins, b) the process of transfer of electrons in photosynthesis as well as c) the process of processing genetic information.</li></ol>

	4. Demonstrate the responsible attitude of his work in biochemical learning II independently
Content:	<p><b>Metabolic aspects and their role in living cells :</b> Macro and micro metabolic aspects, energy cycles</p> <p><b>Carbohydrate Catabolism :</b> Glycolysis, Glycogenesis, Anaerobic Reactions (Fermentation), Citric Acid Cycle, Oxidative Phosphorylation, ATP Calculation, Gluconeogenesis, Glyconeogenesis, Catabolism Control</p> <p><b>Photosynthesis :</b> Dark reactions – light, Calvin Cycle, Hatch Cycle – Slack</p> <p><b>Amino acid catabolism and Purine - Pyrimidin :</b> Intermediat pathways of amino acid catabolism, transaminases reactions, nitrogen secretion pathways in ammonotelics, ureotelic, and uricotelic, urea cycles. Synthesis of amino acids from ammonium through 3 enzymatic reactions and their regulation, synthesis of amino acids from glutamate transaminases reactions with <math>\alpha</math>-keto acid, degradation and synthesis of Purines – Pyrimidin</p> <p><b>Lipide catabolism :</b> Saturated fatty acid catabolism, Unsaturated fatty acid, and - oxidation, ketogenesis and control. Lipogenesis, anabolism in special fats, control</p> <p><b>Genetic Information Flow :</b> Replication, Transcription, Translation and Lac Operon</p>
Study / exam achievements:	<p>Students are considered to be competent and pass if at least get 55</p> <p>Final score is calculated as follows: 20% participation + 30% assignment + 20% middle exam (UTS) &amp; 30% final exam (UAS)</p> <p>Table index of graduation</p> <ul style="list-style-type: none"> <li>● A = 4 (85 ≤ - &lt; 100)</li> <li>● A- = 3,75 (80 ≤ - &lt; 85)</li> <li>● B+ = 3,5 (75 ≤ - &lt; 80)</li> <li>● B = 3 (70 ≤ - &lt; 75)</li> <li>● B- = 2,75 (65 ≤ - &lt; 75)</li> <li>● C+ = 2,5 (60 ≤ - &lt; 65)</li> <li>● C = 2 (55 ≤ - &lt; 60)</li> <li>● D = 1 (40 ≤ - &lt; 55)</li> <li>● E = 0 (0 ≤ - &lt; 40)</li> </ul>
Media:	Computer, White board
Learning Methods	Individuals assignment, group assignment, discussion, presentation
Literature:	1. Ayala, F.J. and Kieger, J.A. 1984. <i>Modern Genetics</i> . California: The Benyamin Cummings Publishing Company Inc..


	<ol style="list-style-type: none"> <li>2. Koolman, J. and Roehm, K.H. 2005. <i>Color Atlas of Biochemistry</i>. 2<sup>nd</sup> edition. New York: Stutgard.</li> <li>3. Lehninger. 1988. <i>Dasar-Dasar Biokimia</i> (I,II,III). Jakarta: Erlangga.</li> <li>4. Mathew,C.K., van Holde, K.E., Ahern, K.G. 1999. <i>Biochemistry</i>. San Fransisco: Addison-Wesley Pub. Co.</li> <li>5. Murray R.K., Granner R.K., Mayes P.A., and Rotwell V.W. 2003. <i>Harper's Illustrated Biochemistry</i>, The McGraw-Hill Companies</li> <li>6. Nelson, D.L. and Cox, M.M. 2003. <i>Lehninger Principle of Biochemistry</i>. 4<sup>th</sup> edition. Madison: University of Winconsin.</li> <li>7. Styer, L., 1988. <i>Biochemistry</i>. New York: W.H. Freeman and Company</li> </ol>
Note	<p>Metabolism and Pathways of Genetics Information covers the activities of theory and presentation.</p> <p>Total ECTS = ((total hours workload x 50 min)/60 min)/25 hours</p> <p>Each ECTS is equals wits 25 hours</p>

## A.2. COURSE TOPIC

Studies on catabolism and anabolism as well as biomolecular regulation of carbohydrates, lipids, proteins, oxidative phosphorylation and electron transfer in photosynthesis, as well as genetic information processing processes conducted through lectures, Q&A, interactive discussions and presentations

### A.3. COURSE PROGRAM

#### SEMESTER LEARNING ACTIYITY PLAN

	<b>UNIVERSITAS NEGERI SURABAYA</b> <b>FACULTY OF MATHEMATICS AND NATURAL SCIENCE</b> <b>UNDERGRADUATE PROGRAMME OF CHEMISTRY</b>					<b>Document Code</b>
<b>SEMESTER LEARNING ACTIYITY PLAN</b>						
<b>COURSE</b>	<b>CODE</b>	<b>Course Group</b>	<b>Credit Unit (sks)</b>		<b>SEMESTER</b>	<b>Date</b>
Metabolism and Pathways of Genetics Information	4720103015	Metabolism and Pathways of Genetics Information	<b>3</b>	<b>0</b>	6	5 <sup>st</sup> August 2021
<b>AUTHORIZATION</b>	<b>Compiler</b>		<b>Coordinator</b>		<b>Head of Study Programe</b>	
<b>CHEMISTRY</b>	Dr. Nuniek Herdyastuti, M.Si		Prof.Dr. Lenny Yuanita, M.Kes		<b>Dr. Amaria, M.Si</b>	
<b>Learning Outcomes</b>	<b>Program Learning Outcomes (PLO)</b>					
	PLO 1	Mastering the concepts of structure, dynamics and energy, as well as the basic principles of separation, analysis, synthesis and characterization of micromolecular compounds and their application				
	PLO 5	Able to apply logical, critical, systematic and innovative thinking in the context of development or application of science and technology by paying attention and applying humanities values in accordance with the field of chemistry in problem solving.				
	<b>Course Learning Outcome</b>					

	CLO 1	Able to solve ipteks problems in the field of chemistry that is common and in simple scope such as identification, analysis, isolation, transformation, and synthesis of micromolecules, through the application of structure, properties, molecular changes, energy and kinetics.
	CLO 2	Able to solve science and technology problems in the field of biochemistry, especially related to metabolism and genetic information processing, based on the study of science and methods of analysis and synthesis, as well as the application of relevant technologies.
	CLO 3	Having knowledge of: a) metabolism and regulation of biomolecules carbohydrates, lipids, and proteins, b) the process of electron transfer in photosynthesis as well as c) the process of processing genetic information.
	CLO 4	Demonstrated a responsible attitude to his work in the study of Biochemistry II, independently.
	<b>Sub CLO</b>	
	Sub-CLO1	Understanding some aspects of metabolism and its role in living cells
	Sub-CLO2	Understanding the formation of ATP on various pathways of carbohydrate catabolism, regulation and its association
	Sub-CLO3	Understanding the process of atp formation through oxidative phosphorylation
	Sub-CLO4	Understanding the formation of ATP on various lines of carbohirat anabolism, regulation and its association
	Sub-CLO5	Understanding the process of photosynthesis
	Sub-CLO6	Understanding amino acid catabolism and its regulation
	Sub-CLO7	Understanding amino acid anabolism and its regulation
	Sub-CLO8	Understanding on metabolism purines and pyrimidin
	Sub-CLO9	Understanding the series of catabolism and anabolism processes of various major lipid compounds
	Sub-CLO10	Understand each stage of genetic information processing and its control
<b>Brief Description of the Course</b>	Study of catabolism and anabolism as well as regulation of biomolecules of carbohydrates, lipids, proteins, oxidative phosphorylation and electron transfer in photosynthesis, as well as the process of processing genetic information	

<b>Study Materials: Learning Materials</b>	Aspects of Metabolism in living things, Carbohydrate Metabolism, Oxidative Phosphorylation, Photosynthesis, Amino Acid Metabolism, Purine and Pyrimidin Metabolism, Lipid Metabolism, Flow of Genetic Information						
<b>Reference</b>	<b>Main :</b>						
	1. Ayala, F.J. and Kieger, J.A. 1984. <i>Modern Genetics</i> . California: The Benyamin Cummings Publishing Company Inc.. 2. Koolman, J. and Roehm, K.H. 2005. <i>Color Atlas of Biochemistry</i> . 2 <sup>nd</sup> edition. New York: Stutgard. 3. Lehninger. 1988. <i>Dasar-Dasar Biokimia</i> (I,II,III). Jakarta: Erlangga. 4. Mathew,C.K., van Holde, K.E., Ahern, K.G. 1999. <i>Biochemistry</i> . San Fransisco: Addison-Wesley Pub. Co. 5. Murray R.K., Granner R.K., Mayes P.A., and Rotwell V.W. 2003. <i>Harper's Illustrated Biochemistry</i> , The McGraw-Hill Companies 6. Nelson, D.L. and Cox, M.M. 2003. <i>Lehninger Principle of Biochemistry</i> . 4 <sup>th</sup> edition. Madison: University of Winconsin. 7. Styer, L., 1988. <i>Biochemistry</i> . New York: W.H. Freeman and Company						
	<b>Supporting :</b>						
	Recent journals related to each topic.						
<b>Lecturer</b>	1. Prof. Dr. Leny Yuanita, M.Kes 2. Prof. Dr. Rudiana Agustini, M.Pd 3. Dr. Prima Retno Wikandari, M.Si 4. Dr. Nuniek Herdyastuti, M.Si 5. Mirwa Adi Prahara, M.Si						
<b>Prerequisite courses</b>	The requirements courses have been courses in Biochemistry						
Meetin g	The final ability of each activity	Assessment		The final ability of each activity		Reference	Rating Weight (%)
		Indicator	Criteria and Form	Luring ( <i>offline</i> )	Daring ( <i>online</i> )		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Understanding some aspects of metabolism and its role in living cells	1. To explain CO <sub>2</sub> and N <sub>2</sub> cycles 2. Explaining heterotrophic and autotrophic relationships	Non test	Lectures, FAQ	-	Macro and micro aspects of metabolism, energy cycle (Book 3,4, 6)	



		<ol style="list-style-type: none"> <li>3. Explaining the difference between catabolism and anabolism</li> <li>4. Explaining the ATP, NADH/NAD<sup>+</sup>, FADH<sub>2</sub>/FAD cycles</li> </ol>					
2	Understanding carbohydrate catabolism : Formation of ATP and Glycolysis	<ol style="list-style-type: none"> <li>1. Describe the link between catabolism and carbohydrate anabolism</li> <li>2. Interpreting the sequence of stages of glycolysis reaction</li> <li>3. Explaining the role of enzymes at each stage of glycolysis</li> <li>4. Distinguishing the stages of aerobic and anaerobic pathways</li> </ol>	Test	Interactive lectures and discussions	-	Carbohydrate catabolism : glycolysis, anaerobic reactions (book 3,4,6, journal)	
3	Understanding catabolism in disaccharides and polysaccharides as well as mechanism of entry in the Glycolysis pathway	<ol style="list-style-type: none"> <li>1. Explaining enzymatic degradation of disaccharides and polysaccharides</li> <li>2. Understanding the mechanism of entry of disaccharides and polysaccharides in the glycolysis pathway</li> <li>3. Explaining the enzymes that play a role in glycogenolysis in the liver as well as extra hepatic</li> </ol>	Non test	Interactive lectures and discussions	-	Catabolism in disaccharides and polysaccharides; the entry path on glycolysis (book 3,4,5,6,7 journal)	

4	Understanding the aerob pathways in carbohydrate catabolism	<ol style="list-style-type: none"> <li>1. Explaining the role of citric acid cycles</li> <li>2. Explain each stage of the citric acid cycle</li> <li>3. Explaining the regulation of citric acid cycles</li> <li>4. Calculate the energy of citric acid cycle results</li> <li>5. 5. Explaining the peculiarities of HMP shunt alternative lines</li> </ol>	Test	Interactive lectures and discussions	-	Citric acid cycle (book 3,4,6, journal)	
5	Understanding the process of atp formation through oxidative phosphorylation	<ol style="list-style-type: none"> <li>1. Explaining the meaning of phosphorylation, oxidative phosphorylation</li> <li>2. Explaining the ATP and NADPH/ NADH cycles</li> <li>3. Mentioning various inhibitor compounds and the location of obstacles</li> <li>4. Distinguishing the glyphosate and malat aspartate shuttle systems</li> <li>5. Calculate the ATP produced in the carbohydrate catabolism process</li> <li>6. Regulation on glycolysis</li> </ol>	Test	Interactive lectures and discussions	-	Oxidative phosphorylation, space reprocessing, ATP calculations, regulation on carbohydrate catabolism (book 2,3,4,5,6,7 journal)	
6	Understanding the use of ATP on various karbohirat	<ol style="list-style-type: none"> <li>1. Explaining the differences in catabolism and</li> </ol>	Non test	Interactive lectures and discussions	-	Pathways carbohydrate	

	anabolism pathways, regulations and associations	<p>anabolism pathways in carbohydrates</p> <ol style="list-style-type: none"> <li>2. Explaining the stages of gluconeogenesis and glycogenesis reactions</li> <li>3. Explaining the control of catabolism and carbohydrate anabolism by the hormone insulin, glucagon</li> </ol>				<p>anabolism, gluconeogenesis, glycogeneogenesis, control of carbohydrate anabolism</p> <p>(book 2,3,4,5,6,7 journal)</p>	
7	Understanding the process photosynthesis	<ol style="list-style-type: none"> <li>1. Explaining photochemical reaction systems</li> <li>2. Mention the stages of bright reaction</li> <li>3. Mention the reaction stage of Calvin's cycle</li> <li>4. Explaining the usefulness of the Hatch-slack cycle</li> <li>5. Mention the Hatch-Slack cycle reaction stage</li> </ol>	Non test	Interactive lectures and discussions	-	<p>Dark – light reactions, Calvin Cycle, Hatch Cycle – Slack</p> <p>(book 2,3,4,5,6 journal)</p>	
<b>8</b>	<b>Midterm Exams</b>						
9	Understanding amino acid catabolism and its regulation	<ol style="list-style-type: none"> <li>1. Explaining the main functions of amino acid catabolism and the role of amino acids as an energy source</li> <li>2. Explaining the Intermediate Pathways of Amino Acid Catabolism</li> </ol>	Test	Interactive lectures and discussions	-	<p>Intermediate pathways of amino acid catabolism, transaminase reactions, nitrogen secretion pathways in</p>	17

		<ol style="list-style-type: none"> <li>3. Explaining the reaction of transaminases in amino acids to form other amino acids</li> <li>4. Explaining the mechanism of transport of ammonia in the body</li> <li>5. Explaining the differences in nitrogen secretion pathways in ammonotelic, ureotelic, and uricotelic.</li> <li>6. Explaining the Urea Cycle</li> </ol>				<p>ammonotelic, ureotelic, and uricotelic, urea cycle</p> <p>(book 2,3,4,5,6,7 journal)</p>	
10	Understanding amino acid anabolism and its regulation	<ol style="list-style-type: none"> <li>1. Explaining the synthesis of amino acids from ammonium through 3 enzymatic reactions: glutamate dehydrogenase, glutamine synthetase and carbamoyl-phosphate synthetase and its regulation</li> <li>2. Explaining the synthesis of amino acids from glutamate transaminase</li> </ol>	NonTest	Interactive lectures and discussions	-	<p>Synthesis of amino acids from ammonium through 3 enzymatic reactions and their regulation, amino acid synthesis from glutamate transaminase reactions with <math>\alpha</math>-keto acid</p>	17

		reactions with $\alpha$ -keto acid				(book 2,3,4,5,6,7)	
	Understanding to metabolism of purines and pyrimidin	<ol style="list-style-type: none"> <li>1.Explaining the degradation of purines</li> <li>2.Explaining Purine Catabolism into uric acid</li> <li>3.Explaining the degradation of pyrimidin</li> <li>4.Explaining the synthesis of AMP and GMP from IMP</li> <li>5.Explaining the role of carbamoil phosphate and aspartate as a pyrimidin base precursor</li> <li>6.Explaining multienzyme systems in pyrimidin base synthesis</li> </ol>	NonTes	Interactive lectures and discussions		Degradation and synthesis Purine – Pyrimidine (book 2,3,4,5,6,7)	
11	Understanding the catabolism process of various major lipid compounds	<ol style="list-style-type: none"> <li>1. Briefly describe the stages of <math>\beta</math>-oxidation</li> <li>2. Calculates the energy generated from complete oxidation of fatty acids</li> <li>3. Explaining additional steps for the odd fatty acid oxitic.</li> </ol>	Tes	Interactive lectures and discussions		Katabolisme asam lemak jenuh, Katabolisme asam lemak tak jenuh, $\alpha$ dan $\omega$ oksidasi, ketogenesis dan pengendalian	

		<ol style="list-style-type: none"> <li>4. Decompose of compact phase-2 oxidation of unsaturated fatty acids</li> <li>5. Explaining the difference in energy oxish with saturated fatty acids</li> <li>6. Explaining the meaning of <math>\alpha</math> and <math>\omega</math> oxidation</li> <li>7. Describe how ketone formation and it's effects</li> </ol>				(book 2,3,4,5,6,7 journal)	
12	Understanding the anabolism process of various major lipid compounds	<ol style="list-style-type: none"> <li>1. Describe of fatty acid anabolism starting from mitochondrial acetyl coA</li> <li>2. Explaining the differences in anabolism of saturated and unsaturated fatty acids</li> <li>3. Describe of stage-2 TG anabolism</li> <li>4. Explaining the principle of phosphoglyceride anabolism</li> <li>5. Mention hormones, enzymes and metabolites that play a role in lipid regulation</li> <li>6. Explaining the regulation of lipolysis</li> </ol>	NonTes	Interactive lectures and discussions	-	<p>Lipogenesis, anabolism in special fats, regulation</p> <p>(book 2,3,4,5,6,7 journal)</p>	

		<p>and lipogenesis (everyday cases).</p> <p>7. Mentioning various substances between the main biosynthesis of skualen, cholesterol</p> <p>8. Explaining the reaction of biosynthesis regulation</p> <p>9. Explaining the relationship of cholesterol with atherosclerosis.</p>					
13	Understand each stage of genetic information processing and its regulation	<p>1. Explaining the replication model</p> <p>2. Explaining DNA polymerase</p> <p>3. Explaining the replication mechanism</p>	Test	Interactive lectures and discussions	-	Replication  (book 1,2,3,4,5,6,7 journal)	
14		<p>1. Explaining the initiation stage</p> <p>2. Explain the elongation stage</p> <p>3. Explaining the termination stage</p> <p>4. Explaining negative control (Lacperon)</p>	Test	Interactive lectures and discussions	-	Transcription  (book 1,2,3,4,5,6,7 journal)	
15		<p>1. Explaining the initiation stage</p> <p>2. Explain the elongation stage</p> <p>3. Explaining the termination stage</p>	Test	Interactive lectures and discussions	-	Translation  (book 1,2,3,4,5,6,7 journal)	
16	<b>Final Exams</b>						





#### A.4. MAPPING OF LEARNING OUTCOMES – COURSE OUTCOMES

##### A.4.1. The Expected Program Learning Outcomes (PLO) of Undergraduate Program of Chemistry (UPCE)

NO	ASPECTS	PLO	CODE
1	KNOWLEDGE	1. Capable to demonstrate knowledge related to theoretical concepts about structure, dynamics, and energy, as well as the basic principles of separation, analysis, synthesis and characterization of chemicals	KNO-1
		2. Capable to demonstrate the pedagogical knowledge of chemistry in designing, implementing, and evaluating chemistry learning	KNO-2
2	SKILL	3. Mastering the principles of occupational health and safety, managing laboratories, using the equipment and operating chemical instruments	SKI-1
		4. Capable to design, implement, evaluate, learn and develop chemistry learning media by utilizing Information and Communication Technology	SKI-2
3	COMPETENCIES	5. Applying logical, critical, systematic and innovative thinking in the context of development or implementation of science, technology, and art that regards and applies humanities in accordance with chemistry education in solving problems	COM-1
		6. Mastering the basics of the scientific method, designing and conducting research, writing scientific reports and communicating them both verbally and in writing by utilizing information and communication technology in the field of education	COM-2
4	ATTITUDE AND SOCIAL	7. Capable to make decisions based on data/information in order to complete their responsibility assignment and evaluate the performance that has been done both individually and in groups, have an entrepreneurial spirit with environmental insight	SOC-1
		8. Capable to adapt to various developments in chemistry, develop and learn continuously throughout life to continue education, both formal and informal	SOC-2

#### A4.2. The Education Program Objectives (PEOs) of Metabolism and Pathways of Genetics Information

PEO 1. Comprehending the concept and chemistry learning, laboratory management, scientific method, and ICT as well as its implementation to solve the problem in their profession.

PEO 2. Having the higher order thinking skills to communicate ideas verbally and in writing, be able to take the right initiatives and to be a good decision maker and having the ability to lead in group working group at relevant fields.

#### A4.3. Mapping of Program Learning Outcomes (PLO) – Education Program Objectives (PEOs)

	PLO 1 (KNO-1)	PLO 5 (COM-1)
PEO 1	√	
PEO 2		√

### B. COURSE ASSESSMENT

#### B.1. Assessment Rubric

Cognitive Criteria

1. The ability to give answers correctly
2. The ability to provide argumentation according to theory
3. The ability to provide systematic explanations
4. The ability to solve problems comprehensively

#### B.2. Assessment System

Final Assessment Course with practicum

Practicum	: 0%
Group/Individuals Assignment	: 30%
Midterm examination	: 30%
Final examination	: 40%

#### Distribution of the weight of the ability of the test item

	PLO 1 (KNO-1)	PLO 5 (COM-1)	Total
Practicum	0%	0%	0%
Group/Individuals Assignment	60%	40%	100%
Midterm examination	80%	20%	100%
Final examination	70%	30%	100%

#### Success Criteria of Program Learning Outcomes (PLO)

Excellence	≥ 80
------------	------

Good	$\geq 70$
Satisfy	$\geq 55$
False	$> 0$

Final index for undergraduate program defined as follow:

Final Index	Range
A	4 (85 $\leq$ - $\geq$ 100)
A <sup>-</sup>	3,75 (80 $\leq$ - $<$ 85)
B <sup>+</sup>	3,5 (75 $\leq$ - $<$ 80)
B	3 (70 $\leq$ - $<$ 75)
B <sup>-</sup>	2,75 (65 $\leq$ - $<$ 75)
C <sup>+</sup>	2,5 (60 $\leq$ - $<$ 65)
C	2 (55 $\leq$ - $<$ 60)
D	1 (40 $\leq$ - $<$ 55)
E	0 (0 $\leq$ - $<$ 40)

## C. COURSE DEVELOPMENT

### C.1. Academic Year 2019/2020 odd semester

Parameter	$\Sigma$ of person	Percentage
Number of students taking this subject	96	66,6%
Number of students who pass at first attempt ( $>C^+$ )	96	34,4%
Number of students who must take remedial	0	0%
Number of failed students after remedial (D & E)	0	0%

### C.2. Problems Analysis

Students are good enough to understand the materials in the course of Metabolism and Pathways of Genetics Information. Although there are some students still trying to memorize the material but have not yet understood it well. This is often also experienced by previous students, to overcome this, then given the task of making a summary related to each material and also given Quiz after being given the material.

### C.3. Solutive Strategy

New teaching and learning methods should be developed for the next academic years, consisting of:

1. Redesigning the course material (PPT slides, course contents, etc.) to become more interesting and interactive to stimulate student's interest to this course.
2. Giving "lecture by online" to stimulate our students to learn about the next lecture topics.
3. Enhance the cooperative skills of students with exchange the methods and models of learning

## D. APPENDICES

### D.1. DOCUMENT OF COURSE ACTIVITY

#### D.1.1. Lecture's journal and student's attendance form [siakadu.uneca.ac.id](http://siakadu.uneca.ac.id)



KEMENTERIAN RISET, TEKNOLOGI, DAN PENDIDIKAN TINGGI  
UNIVERSITAS NEGERI SURABAYA

Kampus Ketintang  
Jalan Ketintang, Surabaya 60231  
T: +6231-8293484  
F: +6231-8293484  
laman: unesa.ac.id  
email : bakpk@unesa.ac.id

#### Aktivitas Perkuliahan

Nama Matakuliah : Biokimia II: Metabolisme

Dosen : PRIMA RETNO WIKANDARI

Kelas : 2017A

(196411151991032001)

Jadwal & Ruang : C06.01.01 (09.30 - 12.00) R.

LENY YUANITA (195109121985032001)

No.	Tanggal	Pertemuan	Topik	Peserta	Status	Dosen	Kecesuaian	Saran
1	05-02-2020	Pertemuan ke 1	Aspek makro dan mikro metabolisme, serta siklus energi	26	Terjadwal	Prima Retno Wikandari		
2	12-02-2020	Pertemuan ke 2	Fosforilasi oksidatif	29	Terjadwal	Leny Yuanita		
3	19-02-2020	Pertemuan ke 3	Katabolisme polisakarida	29	Terjadwal	Leny Yuanita		
4	26-02-2020	Pertemuan ke 4	1. Crebs cycle	28	Terjadwal	Leny Yuanita		
5	04-03-2020	Pertemuan ke 5	glikogenesis-glikogenolisis	29	Terjadwal	Leny Yuanita		
6	11-03-2020	Pertemuan ke 6	Glukoneogenesis, met lipid	30	Terjadwal	Leny Yuanita		
7	18-03-2020	Pertemuan ke 7	anabolisme lipid dan pengendaliannya	31	Terjadwal	Leny Yuanita		
8	25-03-2020	Pertemuan ke 8	UTS Met KH dan lipda	30	Terjadwal	Leny Yuanita		
9	01-04-2020	Pertemuan ke 9	Peran utama hasil katabolisme asam amino sebagai sumber energi, jalur degradasi asam amino, sekresi nitrogen	30	Terjadwal	Leny Yuanita		
10	08-04-2020	Pertemuan ke 10	Anabolisme asam amino Sintesis dan degradasi purin serta pirimidin	30	Terjadwal	Leny Yuanita		
11	15-04-2020	Pertemuan ke 11	sintesis degradasi purin pirimidin	31	Terjadwal	Leny Yuanita		
12	22-04-2020	Pertemuan ke 12	Sintesis lemak dan regulasinya	31	Terjadwal	Prima Retno Wikandari		
13	29-04-2020	Pertemuan ke 13	Replikasi	31	Terjadwal	Prima Retno Wikandari		
14	06-05-2020	Pertemuan ke 14	Transkripsi	31	Terjadwal	Prima Retno Wikandari		
15	13-05-2020	Pertemuan ke 15	Translasi	31	Terjadwal	Prima Retno Wikandari		



Aktivitas Perkuliahan

Nama Matakuliah : Biokimia II: Metabolisme

Dosen : PRIMA RETNO WIKANDARI

Kelas : 2017B

(196411151991032001)

Jadwal & Ruang : C05.01.08 (09.30 - 12.00) R.

LENY YUANITA (195109121985032001)

No.	Tanggal	Pertemuan	Topik	Peserta	Status	Dosen	Kesesuaian	Saran
1	03-02-2020	Pertemuan ke 1	Aspek makro dan mikro metabolisme, serta siklus energi	27	Terjadwal	Leny Yuanita		
2	10-02-2020	Pertemuan ke 2	FOsforilasi oksidatif	30	Terjadwal	Leny Yuanita		
3	17-02-2020	Pertemuan ke 3	Katabolisme polisakarida- Glikolisis	30	Terjadwal	Leny Yuanita		
4	24-02-2020	Pertemuan ke 4	Siklus asam sitrat dan HMP shunt 	30	Terjadwal	Leny Yuanita		
5	02-03-2020	Pertemuan ke 5	Glikogenesis, glikogenolisis	29	Terjadwal	Leny Yuanita		
6	09-03-2020	Pertemuan ke 6	Glukoneogenesis, met lipid	29	Terjadwal	Leny Yuanita		
7	16-03-2020	Pertemuan ke 7	anabolisme TG dan pengendalian met lipid 	30	Terjadwal	Leny Yuanita		
8	23-03-2020	Pertemuan ke 8	UTS met karbohidrat, lipida	30	Terjadwal	Leny Yuanita		
9	30-03-2020	Pertemuan ke 9	Peran utama hasil katabolisme asam amino sebagai sumber energi, jalur degradasi asam amino, sekresi nitrogen	30	Terjadwal	Leny Yuanita		
10	06-04-2020	Pertemuan ke 10	Anabolisme asam amino Sintesis dan degradasi purin serta pirimidin	30	Terjadwal	Leny Yuanita		
11	13-04-2020	Pertemuan ke 11	purin pirimidin	30	Terjadwal	Leny Yuanita		
12	20-04-2020	Pertemuan ke 12	Sintesis lemak dan regulasinya	30	Terjadwal	Prima Retno Wikandari		
13	27-04-2020	Pertemuan ke 13	Replikasi	30	Terjadwal	Prima Retno Wikandari		
14	04-05-2020	Pertemuan ke 14	Transkripsi	30	Terjadwal	Prima Retno Wikandari		
15	11-05-2020	Pertemuan ke 15	Translasi	30	Terjadwal	Prima Retno Wikandari		



**PRESENSI KULIAH**  
 Periode 2019/2020 Genap

**Mata Kuliah** : Biokimia II: Metabolisme  
**Kelas** : 2017A  
**Prodi** : S1 Kimia

**Dosen** : Dr. Prima Retno Wikandari, M.Si.  
 Prof. Dr. Leny Yuanita, M.Kes.

No	NIM	Nama Mahasiswa	Pertemuan Ke															%
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
			05 Feb 20	12 Feb 20	19 Feb 20	26 Feb 20	04 Mar 20	11 Mar 20	18 Mar 20	25 Mar 20	01 Apr 20	08 Apr 20	15 Apr 20	22 Apr 20	29 Apr 20	06 May 20	13 May 20	
1.	15030234008	DHIEMAS FEBRYAN DWI CANDRA	A	A	A	A	A	A	H	A	A	A	H	H	H	H	H	40 %
2.	16030234005	SOFIA MADANI	A	H	H	A	H	H	H	H	H	H	H	H	H	H	H	86,7 %
3.	16030234026	EDLYN AINAYAH AN NABILAH	A	A	A	A	A	H	H	H	H	H	H	H	H	H	H	66,7 %
4.	16030234038	MARDHANTI RIZKY AMALIYA	A	H	H	H	H	H	H	H	H	H	H	H	H	H	H	93,3 %
5.	17030234001	RIZKI AMALIA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
6.	17030234003	DEWINTA INTAN LAILY	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
7.	17030234005	LISTYOWATI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
8.	17030234007	ELMA ALFIANTI INDRI LESTARI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
9.	17030234009	LAILATUL WAKHIDAH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
10.	17030234011	SHELA INSANUL HIKMAH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
11.	17030234013	PERINTIS GITA SUSANTI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
12.	17030234015	SAVIRA AYU NINGTIAS	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
13.	17030234017	MEUTIA ASRY	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
14.	17030234019	FIANTI DAMAYANTI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
15.	17030234021	NUR WANDA AINI NATASYA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
16.	17030234023	IKA NOVIANTI SAFITRI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
17.	17030234025	LAILA ROIKHATUL JANNAH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
18.	17030234027	NAJUL HIDAYAH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
19.	17030234029	RIZA RIFIYA NURUL MAWADDAH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
20.	17030234033	IRENE CORNELIA CONSTANTY	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
21.	17030234037	JIHAN SHOFWATUL ISLAM DALILAH AZIZ	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
22.	17030234039	KELVIN RIO K.	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
23.	17030234041	MOCHAMMAD LUTHFI HAMDANI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
24.	17030234042	JONATHAN ANGELO RANAMANGGALA	A	H	H	H	H	H	H	H	H	H	H	H	H	H	H	93,3 %
25.	17030234044	ALFIATUS SOLICHAH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
26.	17030234046	NAFISA CAHYANI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
27.	17030234050	AULIA HANAUL IZZAH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
28.	17030234052	RIZKA DWI SAFITRI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
29.	17030234056	WEKA FIRDA RIZKI NURZULLA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
30.	17030234060	MAGDALENA BUTAR BUTAR	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
31.	17030234062	TRIFENA MEYSIA YUSUF	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %
Tanda Tangan Dosen / Asisten																		



**PRESENSI KULIAH**  
Periode 2019/2020 Genap

Mata Kuliah : Biokimia II: Metabolisme  
Kelas : 2017B  
Prodi : S1 Kimia

Dosen : Dr. Prima Retno Wikandari, M.Si.  
Prof. Dr. Leny Yuanita, M.Kes.

No	NIM	Nama Mahasiswa	Pertemuan Ke															%
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
			03 Feb 20	10 Feb 20	17 Feb 20	24 Feb 20	02 Mar 20	09 Mar 20	16 Mar 20	23 Mar 20	30 Mar 20	06 Apr 20	13 Apr 20	20 Apr 20	27 Apr 20	04 May 20	11 May 20	
1.	17030234002	AMALINA NUR FIDIYAH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
2.	17030234004	DEVY PUSPITA SARI	A	H	H	H	H	H	H	H	H	H	H	H	H	H	93.3 %	
3.	17030234006	NUR AIDA AMYLIANA	H	H	H	H	A	A	H	H	H	H	H	H	H	H	86.7 %	
4.	17030234008	KUALA WIRIDA WENING	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
5.	17030234010	DICKY DHARMAWAN	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
6.	17030234012	DIMAS AYU YULIANTI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
7.	17030234014	MUKHAMAD ROJIB AMINUDIN	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
8.	17030234016	BELA NUR WIDODO	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
9.	17030234018	RIZKA TAZKY AMALIA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
10.	17030234020	JULIAN SAGUS BRAMASTA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
11.	17030234026	FATIMATUZZAHRO	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
12.	17030234028	ESSA FEBRIANA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
13.	17030234030	AINUN RACHMATINA ATQA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
14.	17030234031	EUCHARISTIA OKTAVIA FIRDA LISTIADI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
15.	17030234032	DHINI TRI WILUJENG	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
16.	17030234034	FIRLIA NUR FADILA	A	H	H	H	H	H	H	H	H	H	H	H	H	H	93.3 %	
17.	17030234035	NORVIRIA TSALASATIN APRILIANI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
18.	17030234036	EKA YULIA MAULIDAH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
19.	17030234038	IANATUL KHAFIDLAH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
20.	17030234040	QURROTA AYUN	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
21.	17030234043	ALIF WILDAN MOHAMMAD	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
22.	17030234045	ZEINUR ROCHMA FANDIS ROMADHON	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
23.	17030234047	RIMBI RODIYANA SOVA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
24.	17030234049	FIDELIA YUSTISIA ADRIANE	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
25.	17030234051	EMILISIA FATIMAH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
26.	17030234053	TIA AYU NOVITASARI	A	H	H	H	H	H	H	H	H	H	H	H	H	H	93.3 %	
27.	17030234055	AMELIA PUTRI DIVINDHA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
28.	17030234057	EXCEL AIDA FRANSISKA	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
29.	17030234059	MARINDA MAYLIANSARISYAH PUTRI	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
30.	17030234061	FATIMATUZ ZAHROH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	100 %	
Tanda Tangan Dosen / Asisten																		

**D.1.2.**

**Sample of statement of examination official report**





**Official Report of The Mid-Term Examination**

Today, Wednesday 11<sup>th</sup> March 2020 The Mid-Term Examination in the Even Semester 2019/2020 via google classroom has been done. The examination start at 07.00 and ends at 08.40 for 100 minutes.

Undergraduate Program : Chemistry Education  
 Course : Metabolism and Pathways of Information Genetics  
 Class : Chemistry Education 2017  
 Lectures : Team

Number of participants : 96 student(s)  
 Number of Attendees : 96 student(s)  
 Number of Absence : - student(s), there are

- |         |         |         |
|---------|---------|---------|
| 1. .... | 4. .... | 7. .... |
| 2. .... | 5. .... | 8. .... |
| 3. .... | 6. .... | 9. .... |

The case during the exam

.....

.....

.....

Supervisor Name :	1. Nuniek	Sign :	1.
	2. Raisa		2.
	3. Moniqsa		3.
	4.		4.

Thus official report of The Mid-Term Examination.

**Set in : Surabaya**  
**Date : 11<sup>th</sup> March 2020**  
**The exam committee,**

**Dr. MurchB, S.Pd., M.Pd.**  
 NIP 197209152003121001

## D.2. SAMPLE OF STUDENT WORK

### D.2.1. Sample of Test Paper



### **D.2.2. Sample of Student's Work**



**SOAL UJIAN AKHIR SEMESTER GASAL 2019/2020**

Mata Ujian	: Biokimia 2
Jurusan/Fakultas	: Kimia / MIPA
Program/Angkatan	: Pendidikan Kimia B / 2017
Hari/Tanggal	: Rabu / 11 Maret 2020
Jam ke	: I
Waktu	: 100 menit
Dosen	: Tim
Sifat Ujian	: Closed Books

75

**EKA ANDINI SANTOSO**

**17030194011**

**PKU17**

**Jawablah pertanyaan berikut pada lembar jawaban yang terpisah!**

1. Jelaskan tiga perbedaan dari katabolisme dan anabolisme! (skor 15)

**Jawab:**

Katabolisme:

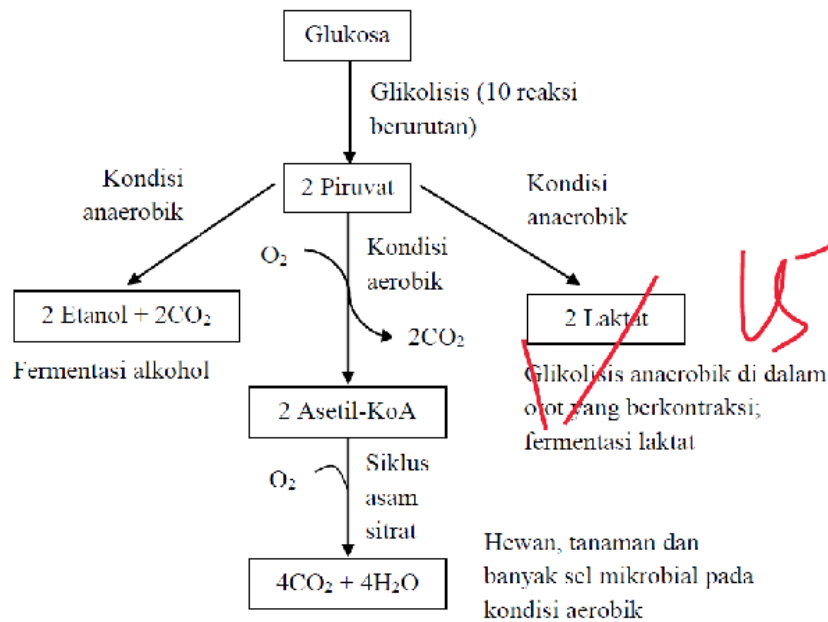
- Degradasi dari makromolekul menjadi  $\text{NH}_3$ ,  $\text{CO}_2$ , dan  $\text{H}_2\text{O}$ .
- Menghasilkan energi.
- Berperan untuk memanfaatkan energi yang digunakan untuk menjalankan fungsi organ.
- Menghasilkan energy yang tidak dibutuhkan lagi oleh tubuh misalnya karbondioksida, asam laktat, dan ammonia.
- Reaksi hidrolisis.

Anabolisme:

- Sintesis makromolekul dari  $\text{NH}_3$ ,  $\text{CO}_2$ , dan  $\text{H}_2\text{O}$ .
- Membutuhkan energi.
- Berperan untuk memperbaiki sistem organ yang mengalami masalah maupun kerusakan.
- Menghasilkan energy yang penting untuk dimanfaatkan tubuh (esensial) seperti glikogen dan protein sebagai bahan bakar dalam tubuh.
- Reaksi sintesis hidrasi.

2. Glukosa merupakan pusat metabolisme dan sumber energi yang tinggi bagi tanaman, hewan maupun mikroorganisme. Jelaskan bagaimana jalur utama glukosa (dalam bentuk bagan) menurut Otto Meyerhof dan Gustav Embden (skor 15)

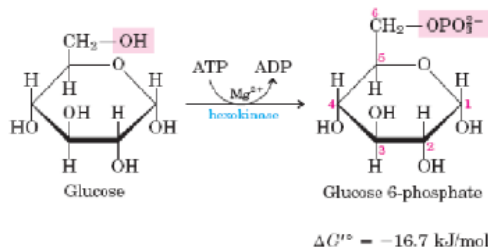
Jawab:



Glikolisis merupakan suatu lintas pusat universal dari katabolisme glukosa pada makhluk hidup. Urutan reaksi glikolitik pada setiap spesies berbeda dalam cara pengaturan kecepatan reaksi dan menghasilkan 2-piruvat.

Terdapat tiga jalur yang dapat dilalui oleh piruvat setelah glikolisis. Pada organisme aerobik, glikolisis menyusun hanya tahap pertama dari keseluruhan degradasi aerobik glukosa menghasilkan 2-Asetil Ko-A dan melepaskan 2CO<sub>2</sub>. 2-Asetil Ko-A akan masuk ke siklus asam sitrat dan menghasilkan menjadi CO<sub>2</sub> dan H<sub>2</sub>O. Pada tahap anaerobik, 2-piruvat akan diubah menjadi 2 etanol dan 2CO<sub>2</sub> pada ragi, sedangkan pada otot yang berkontraksi dan fermentasi laktat akan menghasilkan 2 laktat.

Salah satu tahapan yang terjadi pada Fase - I glikolisis adalah seperti pada reaksi di bawah ini :

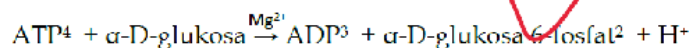


Reaksi apa yang terjadi pada tahap tersebut dan apa yang dapat Saudara jelaskan dari reaksi tersebut ? (skor 15)

Jawab:

Tahap fosforilasi glukosa.

Pada tahap tersebut terjadi aktivasi glukosa (C-6) dengan ATP membentuk glukosa-6P, yang dikatalisis dengan enzim heksokinase.



Enzim heksokinase diaktifkan oleh Mg<sup>2+</sup>. Heksokinase membutuhkan Mg<sup>2+</sup> karena substrat sebenarnya dari enzim ini bukan ATP<sub>4</sub> tetapi kompleks MgATP<sup>2-</sup>.

90

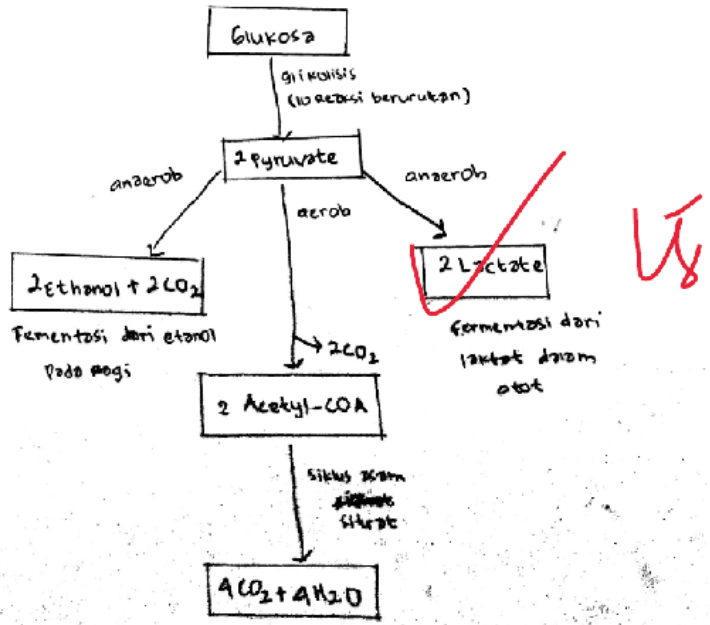
Mata Ujian : Biokimia II  
Jurusan : KIMIA / PKA 2017  
Nama : AINUN NISA  
NIM : 17030194078  
Hari/tanggal : Minggu, 26 April 2020

Jawaban

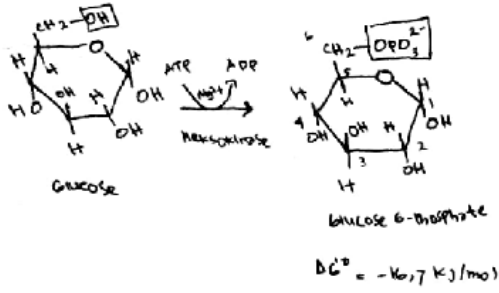
1. Perbedaan Katabolisme dan Anabolisme

- a.) Katabolisme
- Degradasi makromolekul ( $O_2, CO_2, H_2$ ) menjadi simple small molekul ( $H_2O, CO_2, NH_3$ )
  - menghasilkan energi (ATP)
  - Kehilangan elektron atau merupakan Reaksi Oksidasi
- b.) Anabolisme
- Sintesis makromolekul (Protein dan asam nukleat) dari simple small molekul ( $H_2O, CO_2, NH_3$ )
  - membutuhkan energi (ATP)
  - mendapatkan elektron atau merupakan Reaksi Reduksi

2. Jalur utama glukosa menurut Otto Meyerhof dan Gustav Embden



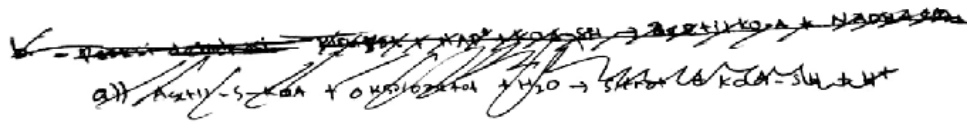
3. Tahapan Fase-1 glikolisis



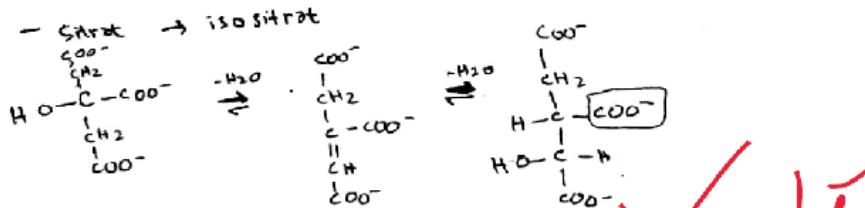
Pada fase-1 glikolisis terjadi reaksi fosforilasi glukosa, pada tahap pertama terjadi aktivasi glukosa (C-6) dengan ATP menghasilkan glukosa 6-fosfat. Reaksi tersebut bersifat tidak dapat kembali yang ditunjukkan oleh tanda ( $\rightarrow$ ), Reaksi tersebut dikatalisis oleh enzim heksokinase (Glukokinase) dengan bantuan ion  $Mg^{2+}$  untuk mengikat molekul heksosa, karena  $Mg^{2+}$  memiliki sifat spesifik terhadap sisi pengikat yakni heksosa berfosfat. Enzim heksokinase merupakan isoenzim, di otot merupakan enzim alosterik (dikambat oleh produk glukosa-6-P), mempunyai harga  $K_M$  kecil (0,1 mM). Harga Energi Gibbs menunjukkan harga minus (-)  $\Delta G^\circ$  yang berarti reaksi tersebut bekerja secara spontan.

4. Siklus asam Sitrat

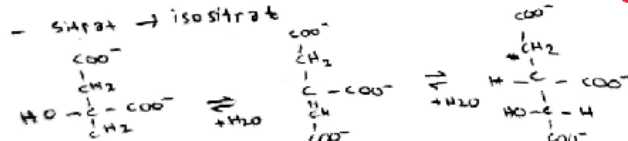
a. Oksaloasetat yang ditemukan dalam sel jumlahnya sangat kecil sekali, karena oksaloasetat merupakan bahan utama dari siklus asam sitrat, siklus asam sitrat sendiri bersifat siklus jadi sekaligus produk terjadi terus menerus sehingga oksaloasetat dalam sel jumlahnya sedikit karena diproses terus menerus dalam siklus asam sitrat.



b. Reaksi dehidrasi



★ Reaksi Hidrasi



### D.3. RECAPITULATION OF ASSESSMENT

#### D.3.1. Validate Test Item

The end-of-semester evaluation questions consist of eight items in the form of essay questions analyzed content through experts in the appropriate field of Chemistry Education analyzed. Essay questions are validated with expert judgment in the course team members. The analysis was conducted by taking into account several aspects, namely the suitability of the questions with the course outcome, language, content and construct.

#### D.3.2 Evaluation Results of Metabolism and Pathways of Genetics Information

PROGRAM STUDI S1 Kimia

DAFTAR NILAI MAHASISWA

Mata Kuliah : Biokimia II: Metabolisme

Kelas : 2017A

Tahun Ajaran : 2019/2020 Genap

#### Keterangan :

1. Komponen nilai yang diisi hanya : Part,Tugas,UTS dan UAS
2. Nilai UAS mahasiswa dengan kehadiran dibawah 73.3% (kolom dg warna merah) tidak akan disimpan
3. Jangan merubah apapun di dokumen ini kecuali pada point nomer satu di atas.
4. PPTI / BAAK tidak menerima file nilai untuk diupload. Proses upload nilai dilakukan oleh dosen pengampu yang bersangkutan.

No	NIM	Nama Mahasiswa	Angkatan	Kehadiran	Part	Tugas	UTS	UAS	NA	Huruf	Pakai
1	15030234008	DHIEMAS FEBRYAN DWI CANDRA	2015	40%	50	0	0	0	10	E	1
2	16030234005	SOFIA MADANI	2016	86.67%	60	70	39	60	58.8	C	1
3	16030234026	EDLYN AINAYYAH AN NABILAH	2016	66.67%	60	70	39	0	40.8	D	1
4	16030234038	MARDHANTI RIZKY AMALIYA	2016	93.33%	71	70	44	72	65.6	B-	1
5	17030234001	RIZKI AMALIA	2017	100%	71	76	39	69	65.5	B-	1
6	17030234003	DEWINTA INTAN LAILY	2017	100%	71	76	39	74	67	B-	1
7	17030234005	LISTYOWATI	2017	100%	78	75	49	75	70.4	B	1
8	17030234007	ELMA ALFIANTI INDRI LESTARI	2017	100%	79	75	44	78	70.5	B	1
9	17030234009	LAILATUL WAKHIDAH	2017	100%	78	76	40	72	68	B-	1
10	17030234011	SHELA INSANUL HIKMAH	2017	100%	76	74	40	70	66.4	B-	1
11	17030234013	PERINTIS GITA SUSANTI	2017	100%	71	80	52	81	72.9	B	1

12	1703023401 5	SAVIRA AYU NINGTIAS	2017	100%	76	76	55	93	76.9	B+	1
13	1703023401 7	MEUTIA ASRY	2017	100%	80	85	100	86	87.3	A	1
14	1703023401 9	FIANTI DAMAYANTI	2017	100%	74	82	57	75	73.3	B	1
15	1703023402 1	NUR WANDA AINI NATASYA	2017	100%	76	76	44	70	67.8	B-	1
16	1703023402 3	IKA NOVIANTI SAFITRI	2017	100%	75	77	49	75	70.4	B	1
17	1703023402 5	LAILA ROIKHATUL JANNAH	2017	100%	71	86	49	76	72.6	B	1
18	1703023402 7	NAILIL HIDAYAH	2017	100%	71	82	54	77	72.7	B	1
19	1703023402 9	RIZA RIFIYA NURUL MAWADDAH	2017	100%	74	74	42	62	64	C+	1
20	1703023403 3	IRENE CORNELIA CONSTANTY	2017	100%	74	77	45	73	68.8	B-	1
21	1703023403 7	JIHAN SHOFWATUL ISLAM DALILAH AZIZ	2017	100%	71	85	49	84	74.7	B	1
22	1703023403 9	KELVIN RIO K.	2017	100%	80	90	72	93	85.3	A	1
23	1703023404 1	MOCHAMMAD LUTHFI HAMDANI	2017	100%	78	90	79	92	86	A	1
24	1703023404 2	JONATHAN ANGELO RANAMANGGALA	2017	93.33%	75	88	72	85	81.3	A-	1
25	1703023404 4	ALFIATUS SOLICHAH	2017	100%	74	75	42	70	66.7	B-	1
26	1703023404 6	NAFISA CAHYANI	2017	100%	74	77	47	78	70.7	B	1
27	1703023405 0	AULIA HANAUL IZZAH	2017	100%	76	80	52	76	72.4	B	1
28	1703023405 2	RIZKA DWI SAFITRI	2017	100%	71	80	52	85	74.1	B	1
29	1703023405 6	WEKA FIRDA RIZKI NURZULLA	2017	100%	80	86	60	88	80.2	A-	1
30	1703023406 0	MAGDALENA BUTAR BUTAR	2017	100%	76	74	37	68	65.2	B-	1
31	1703023406 2	TRIFENA MEYSIA YUSUF	2017	100%	74	75	40	73	67.2	B-	1

Original data  
:

PROGRAM STUDI S1 Kimia  
DAFTAR NILAI MAHASISWA  
Mata Kuliah : Biokimia II: Metabolisme  
Kelas : 2017B  
Tahun Ajaran : 2019/2020 Genap

**Keterangan :**

1. Komponen nilai yang diisi hanya :  
Part,Tugas,UTS dan UAS
2. Nilai UAS mahasiswa dengan kehadiran dibawah 73.3% (kolom dg warna merah) tidak akan disimpan



3. Jangan merubah apapun di dokumen ini kecuali pada point nomer satu di atas.

4. PPTI / BAAK tidak menerima file nilai untuk diupload. Proses upload nilai dilakukan oleh dosen pengampu yang bersangkutan.

No	NIM	Nama Mahasiswa	Angkatan	Kehadiran	Part	Tugas	UTS	UAS	NA	Huruf	Pakai
1	17030234002	AMALINA NUR FIDIYAH	2017	100%	72	75	45	81	70.2	B	1
2	17030234004	DEVY PUSPITA SARI	2017	93.33%	79	74	42	82	71	B	1
3	17030234006	NUR AIDA AMYLIANA	2017	86.67%	72	80	55	83	74.3	B	1
4	17030234008	KUALA WIRIDA WENING	2017	100%	78	70	39	80	68.4	B-	1
5	17030234010	DICKY DHARMAWAN	2017	100%	78	82	62	74	74.8	B	1
6	17030234012	DIMAS AYU YULIANTI	2017	100%	84	84	64	88	81.2	A-	1
7	17030234014	MUKHAMAD ROJIB AMINUDIN	2017	100%	75	80	64	84	77	B+	1
8	17030234016	BELA NUR WIDODO	2017	100%	79	90	77	81	82.5	A-	1
9	17030234018	RIZKA TAZKY AMALIA	2017	100%	75	75	49	77	70.4	B	1
10	17030234020	JULIAN SAGUS BRAMASTA	2017	100%	85	80	84	82	82.4	A-	1
11	17030234026	FATIMATUZZAHRO	2017	100%	69	80	54	79	72.3	B	1
12	17030234028	ESSA FEBRIANA	2017	100%	79	78	52	82	74.2	B	1
13	17030234030	AINUN RACHMATINA ATQA	2017	100%	75	75	45	79	70.2	B	1
14	17030234031	EUCARISTIA OKTAVIA FIRDA LISTIADI	2017	100%	72	86	69	88	80.4	A-	1
15	17030234032	DHINI TRI WILUJENG	2017	100%	78	75	45	77	70.2	B	1
16	17030234034	FIRLIA NUR FADILA	2017	93.33%	78	75	49	78	71.3	B	1
17	17030234035	NORVIRIA TSALASATIN APRILIANI	2017	100%	78	75	49	75	70.4	B	1
18	17030234036	EKA YULIA MAULIDAH	2017	100%	75	80	55	82	74.6	B	1
19	17030234038	IANATUL KHAFIDLAH	2017	100%	72	87	70	88	80.9	A-	1
20	17030234040	QURROTA AYUN	2017	100%	79	86	74	88	82.8	A-	1
21	17030234043	ALIF WILDAN MOHAMMAD	2017	100%	74	85	67	81	78	B+	1
22	17030234045	ZEINUR ROCHMA FANDIS ROMADHON	2017	100%	75	78	55	86	75.2	B+	1
23	17030234047	RIMBI RODIYANA SOVA	2017	100%	78	78	55	82	74.6	B	1

24	1703023404 9	FIDELIA YUSTISIA ADRIANE	2017	100%	78	79	59	88	77.5	B+	1
25	1703023405 1	EMILISIA FATIMAH	2017	100%	75	72	44	78	68.8	B-	1
26	1703023405 3	TIA AYU NOVITASARI	2017	93.33%	75	82	62	78	75.4	B+	1
27	1703023405 5	AMELIA PUTRI DIVINDHA	2017	100%	68	83	64	76	74.1	B	1
28	1703023405 7	EXCEL AIDA FRANSISKA	2017	100%	72	76	47	81	70.9	B	1
29	1703023405 9	MARINDA MAYLIANSARISYAH PUTRI	2017	100%	79	87	69	85	81.2	A-	1
30	1703023406 1	FATIMATUZ ZAHROH	2017	100%	72	76	55	79	71.9	B	1

**D.3.3 Percentage of PLO achievements of metabolism and Pathways of Genetics information at Academic Year 2019/2020**

## PLO ASSESSMENT

Lecture : Metabolism and Pathways of Genetics Informa  
 Code : 4720103015  
 Department : Chemistry Department  
 Total of Student : 60

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8
EXELENCE	17%				20%			
GOOD	35%				50%			
SATISFY	47%				28%			
FALSE	2%				2%			
	100%	0%	0%	0%	100%	0%	0%	0%

