



Universitas Negeri Surabaya
Faculty of Mathematics and Natural Sciences
Undergraduate Chemistry Education Study Program

Document
Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Metabolism and Genetic Information Flow	8420403311		T=3	P=0	ECTS=4.77	4	July 17, 2024
AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator				
	Prof. Dr. Utiya Azizah, M.Pd.				

Learning model	Case Studies
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Program Learning Outcomes (PLO)	PLO study program which is charged to the course																																																																																				
	PLO-11	Able to demonstrate knowledge related to theoretical concepts about structure, dynamics and energy, as well as basic principles of separation, analysis, synthesis and characterization of chemicals (CPL 1)																																																																																			
	Program Objectives (PO)																																																																																				
	PO - 1	Able to solve science and technology problems in the general field of chemistry and in simple scopes such as identification, analysis, isolation, transformation and synthesis of micromolecules, through the application of structure, properties, molecular changes, energy and kinetics.																																																																																			
	PO - 2	Able to solve science and technology problems in the field of biochemistry, especially those related to metabolism and processing of genetic information, based on scientific studies and methods of analysis and synthesis, as well as the application of relevant technology.																																																																																			
	PO - 3	Have knowledge about: a) metabolism and regulation of biomolecules, carbohydrates, lipids and proteins, b) electron transfer processes in photosynthesis and c) genetic information processing processes																																																																																			
	PLO-PO Matrix																																																																																				
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PO Matrix at the end of each learning stage (Sub-PO)																																																																																					
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Short Course Description	Study of catabolism and anabolism and regulation of carbohydrate biomolecules, lipids, proteins, oxidative phosphorylation and electron transfer in photosynthesis, as well as genetic information processing
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References	<p>Main :</p> <ol style="list-style-type: none"> 1. Ayala, F.J. and Kieger, J.A. 1984. Modern Genetics . California: The Benyamin Cummings Publishing Company Inc.. 2. Koolman, J. and Roehm, K.H. 2005. Color Atlas of Biochemistry . 2 nd edition. New York: Stutgard. 3. Lehninger. 1988. Dasar-Dasar Biokimia (I,II,III). Jakarta: Erlangga. 4. Mathew,C.K., van Holde, K.E., Ahern, K.G. 1999. Biochemistry. San Fransisco: Addison-Wesley Pub. Co. 5. Murray R.K., Granner R.K., Mayes P.A., and Rotwell V.W. 2003. Harper's Illustrated Biochemistry , The McGraw-Hill Companies 6. Nelson, D.L. and Cox, M.M. 2003. Lehninger Principle of Biochemistry . 4th edition. Madison: University of Winconsin. 7. Styer, L., 1988. Biochemistry. New York: W.H. Freeman and Company
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		Supporters:					
		1. Journal-journal terkini yang terkait dengan masing-masing topik.					
Supporting lecturer		Prof. Dr. Hj. Rudiana Agustini, M.Pd. Dr. Prima Retno Wikandari, M.Si. Prof. Dr. Nuniek Herdyastuti, M.Si. Mirwa Adiprahara Anggarani, S.Si., M.Si. Muhammad Nurrohman Sidiq, S.Si., M.Sc., Ph.D. dr. Shod Abdurrachman Dzulkarnain, M.Biomed					
Week-	Final abilities of each learning stage (Sub-PO)	Evaluation		Help Learning, Learning methods, Student Assignments, [Estimated time]		Learning materials [References]	Assessment Weight (%)
		Indicator	Criteria & Form	Offline (offline)	Online (online)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Understand some aspects of metabolism and its role in living cells	1. Explain the CO ₂ and N ₂ cycle 2. Explain the relationship between heterotrophs and autotrophs 3. Explain the difference between catabolism and anabolism 4. Explain the ATP, NADH/NAD, FADH ₂ /FAD cycles	Criteria: Oral test Form of Assessment : Participatory Activities	Form: lecture Method: Lecture, discussion, question and answer 3x50 minutes		Material: Macro and micro aspects of metabolism, energy cycles References: <i>Nelson, DL and Cox, MM 2003. Lehninger Principle of Biochemistry. 4th edition. Madison: University of Wisconsin.</i>	5%
2	Understanding carbohydrate catabolism: ATP formation and glycolysis	1. Analyze the relationship between the catabolism and anabolism pathways of carbohydrates 2. Understand the sequence of stages of the glycolysis reaction 3. Explain the role of enzymes in each stage of glycolysis 4. Distinguish between the stages of the aerobic and anaerobic pathways	Criteria: Oral test Form of Assessment : Participatory Activities	Form: lecture Method: Lecture and case study Student assignment: discuss the stages of glycolysis through EMP Pathway Images 3x50 minutes		Material: carbohydrate catabolism: ATP formation and glycolysis Reference: <i>Lehninger. 1988. Basics of Biochemistry (I, II, III). Jakarta: Erlangga.</i>	5%
3	Understand the catabolism of disaccharides and polysaccharides and the mechanism of their entry into the glycolysis pathway	1. Explain the enzymatic degradation of disaccharides and polysaccharides 2. Understand the mechanism of entry of disaccharides and polysaccharides in the glycolysis pathway 3. Explain the enzymes that play a role in glycogenolysis in the liver and extra hepatic	Criteria: Oral test Form of Assessment : Participatory Activities	Method: Lecture, discussion and question and answer Student assignment: discuss the stages of catabolism in disaccharides and polysaccharides and the mechanism of entry into the glycolysis pathway 3 x 50 minutes		Material: catabolism of disaccharides and polysaccharides and the mechanism of entry into the glycolysis pathway. Bibliography: <i>Styer, L., 1988. Biochemistry. New York: WH Freeman and Company</i>	5%
4	Understanding the anaerobic pathway in carbohydrate catabolism		Form of Assessment : Participatory Activities	Form: lecture Method: Lecture, discussion and question and answer Student assignment: discuss the differences between aerobic and anaerobic pathways		Material: aerobic pathway in carbohydrate catabolism References: <i>Mathew, CK, van Holde, KE, Ahern, KG 1999. Biochemistry. San Francisco: Addison-Wesley Pub. Co.</i>	5%

5	Understand the process of ATP formation through oxidative phosphorylation		Criteria: Oral test Form of Assessment : Participatory Activities	Form: lecture Method: Lecture, discussion and question and answer Student assignment: discuss the differences between the Glycerol phosphate and Malate Aspartate metabolic systems and the amount of ATP produced in the two pathways		Material: ATP formation process through oxidative phosphorylation References: Styer, L., 1988. <i>Biochemistry</i> . New York: WH Freeman and Company	5%
6	Understand the use of ATP in various pathways of carbohydrate metabolism, their regulation and interrelationships		Criteria: Oral test Form of Assessment : Participatory Activities	Form: lecture Method: Lecture, discussion and question and answer		Material: use of ATP in various carbohydrate anabolism pathways, regulation and their relationships. Reference: Murray RK, Granner RK, Mayes PA, and Rotwell VW 2003. <i>Harper's Illustrated Biochemistry</i> , The McGraw-Hill Companies	7%
7	Understand the process of photosynthesis	1. Explain the photochemical reaction system 2. Describe the stages of the light reaction 3. Describe the reaction stages of the Calvin cycle 4. Explain the use of the Hatch-slack cycle 5. Analyze the reaction stages of the Hatch-Slack cycle	Criteria: Oral test Form of Assessment : Participatory Activities	Form: lecture Method: Lecture and PJBL Student assignment: make a video about the process of photosynthesis in groups		Material: photosynthesis process References: Mathew, CK, van Holde, KE, Ahern, KG 1999. <i>Biochemistry</i> . San Francisco: Addison-Wesley Pub. Co.	7%
8			Form of Assessment : Test				10%
9	Understanding amino acid catabolism and its regulation	1. Explain the main function of amino acid catabolism and the role of amino acids as a source of energy. 2. Explain the intermediate pathway for amino acid catabolism. 3. Explain the transaminase reaction in amino acids to form other amino acids. 4. Explain the mechanism for transporting ammonia in the body. 5. Explain the differences in nitrogen secretion pathways in ammonotelic, ureotelic, and uricotelic. 6. Explain the Urea Cycle	Criteria: Oral test Form of Assessment : Participatory Activities	Form: lecture Method: Lecture, discussion and question and answer Student assignment: discuss the differences in nitrogen secretion pathways in ammonotelic, ureotelic, and uricotelic. Explaining the 3x50 minute Urea Cycle		Material: Amino acid catabolism and its regulation References: Mathew, CK, van Holde, KE, Ahern, KG 1999. <i>Biochemistry</i> . San Francisco: Addison-Wesley Pub. Co.	7%

10	Understanding amino acid anabolism and its regulation	1. Explain the synthesis of amino acids from ammonium through 3 enzymatic reactions: glutamate dehydrogenase, glutamin synthetase and carbamoyl-phosphate synthetase and their regulation 2. Explain the synthesis of amino acids from the reaction of glutamate transaminase with α -keto acid	Criteria: Oral test Form of Assessment : Participatory Activities	Form: lecture Method: Lecture, discussion and question and answer		Material: Amino acid anabolism and its regulation References: <i>Nelson, DL and Cox, MM 2003. Lehninger Principle of Biochemistry. 4th edition. Madison: University of Wisconsin.</i>	7%
11	Understand the series of catabolism processes of various main lipid compounds	1. Briefly describe the stages of \square oxidation 2. Calculate the energy produced from the complete oxidation of fatty acids 3. Explain additional steps for the oxidation of odd fatty acids. 4. Briefly describe the stages of oxidation of unsaturated fatty acids. 5. Calculate the ATP produced from the oxidation of fatty acids. 6. Describe how ketones are formed and the effects	Criteria: Oral test Form of Assessment : Participatory Activities	Form: lecture Method: Lecture and case study Student assignment: discuss how much ATP is produced from the oxidation of fatty acids		Material: series of catabolism processes of various major lipid compounds. References: <i>Murray RK, Granner RK, Mayes PA, and Rotwell VW 2003. Harper's Illustrated Biochemistry, The McGraw-Hill Companies</i>	5%
12	Understand the series of anabolism processes of various main lipid compounds		Criteria: Oral test Form of Assessment : Participatory Activities	Form: lecture Method: Lecture and case study Student assignment: discuss the relationship between cholesterol and atherosclerosis		Material: series of anabolism processes of various main lipid compounds. Reference: <i>Styer, L., 1988. Biochemistry. New York: WH Freeman and Company</i>	7%
13	Understand each stage of genetic information processing and its control	1. Explain the model of replication 2. Explain DNA polymerase 3. Explain the mechanism of replication 4. Explain the difference between replication on the leading strand and the lagging strand	Criteria: Oral test Form of Assessment : Participatory Activities	Form: lecture Method: Lecture and question and answer Student assignment: discuss the differences between replication in the leading strand and lagging strand		Material: processing of genetic information and its control. Reference: <i>Ayala, FJ and Kieger, JA 1984. Modern Genetics. California: The Benjamin Cummings Publishing Company Inc..</i>	5%

14	Understand each stage of genetic information processing and its control	1. Explain the meaning of transcription 2. Explain the initiation stage of transcription 3. Explain the elongation stage of transcription 4. Explain the termination stage of transcription 5. Explain the maturation stage of transcription in the Eukaryot group 6. Explain the control of transcription (Lacperon)	Criteria: Oral test Form of Assessment : Project Results Assessment / Product Assessment	Form: lecture Method: Lecture, discussion and question and answer		Material: processing of genetic information and its control. Reference: <i>Ayala, FJ and Kieger, JA 1984. Modern Genetics. California: The Benjamin Cummings Publishing Company Inc..</i>	5%
15	Understand each stage of genetic information processing and its control	1. Explain the meaning of translation 2. Explain the activation stages of amino acids 3. Explain the genetic code 4. Explain the initiation stage in translation 5. Explain the elongation stage in translation 6. Explain the termination stage in translation	Form of Assessment : Project Results Assessment / Product Assessment	Form: lecture Method: Lecture, discussion and question and answer		Material: processing of genetic information and its control. Reference: <i>Ayala, FJ and Kieger, JA 1984. Modern Genetics. California: The Benjamin Cummings Publishing Company Inc..</i> Material: processing of genetic information and its control. Reference: <i>Ayala, FJ and Kieger, JA 1984. Modern Genetics. California: The Benjamin Cummings Publishing Company Inc..</i>	5%
16			Form of Assessment : Test				10%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	70%
2.	Project Results Assessment / Product Assessment	10%
3.	Test	20%
		100%

Notes

- Learning Outcomes of Study Program Graduates (PLO - Study Program)** are the abilities possessed by each Study Program graduate which are the internalization of attitudes, mastery of knowledge and skills according to the level of their study program obtained through the learning process.
- The PLO imposed on courses** are several learning outcomes of study program graduates (CPL-Study Program) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
- Program Objectives (PO)** are abilities that are specifically described from the PLO assigned to a course, and are specific to the study material or learning materials for that course.
- Subject Sub-PO (Sub-PO)** is a capability that is specifically described from the PO that can be measured or observed and is the final ability that is planned at each learning stage, and is specific to the learning material of the course.
- Indicators for assessing** ability in the process and student learning outcomes are specific and measurable statements that identify the ability or performance of student learning outcomes accompanied by evidence.
- Assessment Criteria** are benchmarks used as a measure or measure of learning achievement in assessments based on predetermined indicators. Assessment criteria are guidelines for assessors so that assessments are consistent and unbiased. Criteria can be quantitative or qualitative.
- Forms of assessment:** test and non-test.
- Forms of learning:** Lecture, Response, Tutorial, Seminar or equivalent, Practicum, Studio Practice, Workshop Practice, Field Practice, Research, Community Service and/or other equivalent forms of learning.

9. **Learning Methods:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent methods.
10. **Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
11. **The assessment weight** is the percentage of assessment of each sub-PO achievement whose size is proportional to the level of difficulty of achieving that sub-PO, and the total is 100%.
12. TM=Face to face, PT=Structured assignments, BM=Independent study.