



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

Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date																																																			
Bioinorganic	4720102010		T=2	P=0	ECTS=3.18	7	July 17, 2023																																																			
AUTHORIZATION		SP Developer		Course Cluster Coordinator		Study Program Coordinator																																																				
			Dr. Amaria, M.Si.																																																				
Learning model	Project Based Learning																																																									
Program Learning Outcomes (PLO)	PLO study program that is charged to the course																																																									
	Program Objectives (PO)																																																									
	PO - 1	Able to apply logical, critical, systematic and innovative thinking in the development or implementation of science and technology to support mastery of Bioinorganic concepts and theories																																																								
	PLO-PO Matrix																																																									
		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">P.O</td> <td colspan="6"></td> </tr> <tr> <td style="text-align: center;">PO-1</td> <td colspan="6"></td> </tr> </table>						P.O							PO-1																																											
P.O																																																										
PO-1																																																										
PO Matrix at the end of each learning stage (Sub-PO)																																																										
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">P.O</td> <td colspan="16" style="text-align: center;">Week</td> </tr> <tr> <td></td> <td style="text-align: center;">1</td><td style="text-align: center;">2</td><td style="text-align: center;">3</td><td style="text-align: center;">4</td><td style="text-align: center;">5</td><td style="text-align: center;">6</td><td style="text-align: center;">7</td><td style="text-align: center;">8</td><td style="text-align: center;">9</td><td style="text-align: center;">10</td><td style="text-align: center;">11</td><td style="text-align: center;">12</td><td style="text-align: center;">13</td><td style="text-align: center;">14</td><td style="text-align: center;">15</td><td style="text-align: center;">16</td> </tr> <tr> <td style="text-align: center;">PO-1</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>						P.O	Week																	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PO-1																	
P.O	Week																																																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16																																										
PO-1																																																										
Short Course Description	Study of the basics of bioinorganics, structure, function and behavior of metallobiomolecules, group elements, p groups and d groups through providing information, journal studies and presentations of several materials.																																																									
References	Main :																																																									
	1. Bertini, L. ,et. al 1994. Bioinorganic Chemistry. California: University Science Books. 2. Frasto da Silva, J. J. R, Williams, R. J. P. , 193. The Biological of the Elements. The Inorganic of life. New York oxford University Press3. Kaim, W. , Schwederski, B. , 1994. Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life. Chishester: John Wiley & Sons4. Jurnal-jurnal terkait bioanorganik																																																									
	Supporters:																																																									
Supporting lecturer	Prof. Dr. Leny Yuanita, M.Kes. Dr. Amaria, M.Si. Prof. Dr. Nuniek Herdyastuti, M.Si. Prof. Dr. Sari Edi Cahyaningrum, M.Si.																																																									
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 the function of Mg and Mn in photosynthesis	1. Explain the process of photosynthesis, explaining energy, enzymes and related metabolites 2. Explain the process of water oxidation 3. Explain the reactions and behavior of Mn	Criteria: Participation Form of Assessment : Participatory Activities	Studying mandatory books and questions and answers 2 X 50			10%
2	Understand the properties and functions of dioxygen in biological systems	1. Explain the properties of dioxygen 2. Explain the function of dioxygen compounds through their reactions 3. Explain the oxygen transport system in the body 4. Explain the Hb transport system that occurs during storage 5. Explain the changes in myoglobin structure that occur during dioxygen storage	Criteria: participation grades and assignments Form of Assessment : Participatory Activities	studying mandatory books and questions and answers 2 X 50			5%
3	Understand the properties and functions of dioxygen in biological systems	1. Explain the properties of dioxygen 2. Explain the function of dioxygen compounds through their reactions 3. Explain the oxygen transport system in the body 4. Explain the Hb transport system that occurs in storage 5. Explain the changes in myoglobin structure that occur during dioxygen storage	Criteria: Participation and tasks Form of Assessment : Participatory Activities	studying mandatory books, discussions, questions and answers 2 X 50			0%
4	Understanding H,C, N,S,P transport	1. Explain the transport of H and O in coenzymes 2. Explain the transport of carbon fragments 3. Explain the transport of N in amino acid compounds 4. Explain the transport of sulfate 5. Explain the transport of phosphate	Criteria: participation and tasks Form of Assessment : Participatory Activities, Project Results Assessment / Product Assessment	discussion and questions and answers 2 X 50			0%
5	Understanding H,C,N,S,O,P transport in biological systems	1. Explain the transport of H and O in coenzymes 2. Explain the transport of carbon fragments 3. Explain the transport of N in amino acids 4. Explain sulfate transport 5. Explain phosphate transport	Criteria: participation and tasks Form of Assessment : Participatory Activities, Project Results Assessment / Product Assessment	Summarize and ask questions 2 X 50			0%

6	Understand the function of alkali and alkaline earth cations	1. Explain the nature of alkali and alkaline earth cations in macrocycle complex compounds 2. Explain active and passive transport through membranes 3. Explain the stability and reconstitution of the Ca ⁴ pump. explain the role of Mg in ATP ase	Criteria: participation and tasks Form of Assessment : Participatory Activities	Review the 2 X 50 journal			5%
7	Understand the function of alkali and alkaline earth cations	1. Explain the properties of alkali and alkaline earth cations in macrocycle complex compounds 2. Explain active and passive transport through membranes 3. Explains the stability and reconstruction of the Ca ⁴ pump. Explain the role of Mg in ATP ase	Criteria: participation and tasks Form of Assessment : Participatory Activities, Practice/Performance	Discussion and review of 2 X 50 journals			5%
8	Students can work on UTS questions with the correct answers	Answer all questions on the UTS questions correctly	Criteria: UTS value Form of Assessment : Test	written test 2 X 50			5%
9	Understanding the function of Fe in Hem and non-Hem compounds	1. explain protein coordination 2. Explain the structure and compounds of the Fe-O-Fe ³ cluster. Explain the role of Fe in oxidative enzymes 4. Explain the classification of Hem proteins from primary and secondary structure 5. Mention the various types of Hem proteins and their locations 6. Explain the function of the Hem protein in electron transfer	Criteria: Participation and Tasks Forms of Assessment : Participatory Activities, Project Results Assessment / Product Assessment, Tests	discussion and assignment 2 X 50			5%

10	understand the function of Fe in Hem and non-Hem compounds	1. Explain protein coordination 2. explains the structure and properties of the Fe-O-Fe ₃ cluster compound. Explain the role of Fe in oxidative enzymes 4. Explain the properties of the Hem unit. explain the classification of Hem proteins from primary and secondary structure 6. Explain the function of heme protein in electron transfer 7. Name the various types of heme proteins and their locations	Criteria: participation and tasks Form of Assessment : Participatory Activities, Project Results Assessment / Product Assessment	discussion and assignment 2 X 50			5%
11	Understanding the function of Co and Ni in biological systems	1. Write the redox reaction in Co methyl cobalamin 2. model systems and the role of apoenzymes 3. explained the mutase activity in reactions with coenzyme B ₁₂ 4. Explain the role of Ni in the enzyme reactions urease, hydrogenase, dehydrogenase, reductase	Criteria: participation and tasks Form of Assessment : Participatory Activities	presentation and discussion 2 X 50			5%
12	Understanding the function of Co and Ni in biological systems	1. Carry out a redox reaction in Co methyl cobalamin 2. write the Co-C ₃ bond breaking reaction. Write down the complex compounds of the B ₁₂ system. Explain the mutase activity in the reaction with coenzyme B ₁₂ 5. Explain the role of Ni in the enzymatic reactions of urease, hydrogenase, dehydrogenase and reductase	Criteria: participation and tasks Form of Assessment : Participatory Activities	presentation and discussion 2 X 50			4%
13	Understanding the function of Cu and Zn in biological systems	1. Explain the binding of dioxygen to Cu hemocyanin 2. Explain the function of Cu in cytochrome 3. Explain the role of Cu in NO ₂ reductase 4. Explaining Cu in superoxide and dismutase reactions	Criteria: participation and tasks Form of Assessment : Participatory Activities, Project Results Assessment / Product Assessment	discussion and presentation 2 X 50			0%
14	Understanding the function of Cu and Zn in biological systems	1. explain the binding of Cu in the ligand, metalocyanin 2. Explain the role of Cu in protein regulation	Criteria: assignments and presentations Form of Assessment : Participatory Activities, Project Results Assessment / Product Assessment	discussion and presentation 2 X 50			0%

15	Understanding the function of Cu and Zn in biological systems	1. Explain the types of proteins associated with proteins2. Explain the regulatory role of Zn in biomolecule synthesis3. explain the role of Zn in hormones4. Explain the function and role of Zn in the digestive system	Criteria: Tasks and participation Forms of Assessment : Participatory Activities, Project Results Assessment / Product Assessment, Portfolio Assessment	discussion and presentation 2 X 50			0%
16	Do UAS questions correctly		Criteria: UAS Form of Assessment : Test	2 X 50			20%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	35.67%
2.	Project Results Assessment / Product Assessment	4.17%
3.	Practice / Performance	2.5%
4.	Test	26.67%
		69.01%

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.
- 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.
- Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
- 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%.
- TM=Face to face, PT=Structured assignments, BM=Independent study.