



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																																	
Physical Chemistry III: Chemical Kinetics	4720103091		T=3 P=0 ECTS=4.77	4	July 18, 2024																																	
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)																																					
	PLO-PO Matrix																																					
		<table border="1" style="margin: auto;"> <tr><td style="width: 30px; height: 30px;">P.O</td></tr> </table>					P.O																															
P.O																																						
	PO Matrix at the end of each learning stage (Sub-PO)																																					
	<table border="1" style="margin: auto;"> <tr> <td rowspan="2" style="width: 30px; height: 30px;">P.O</td> <td colspan="16" style="text-align: center;">Week</td> </tr> <tr> <td style="width: 20px;">1</td><td style="width: 20px;">2</td><td style="width: 20px;">3</td><td style="width: 20px;">4</td><td style="width: 20px;">5</td><td style="width: 20px;">6</td><td style="width: 20px;">7</td><td style="width: 20px;">8</td><td style="width: 20px;">9</td><td style="width: 20px;">10</td><td style="width: 20px;">11</td><td style="width: 20px;">12</td><td style="width: 20px;">13</td><td style="width: 20px;">14</td><td style="width: 20px;">15</td><td style="width: 20px;">16</td> </tr> </table>					P.O	Week																1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
P.O	Week																																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16																						
Short Course Description	Empirical and theoretical studies of reaction rates as a function of concentration, temperature and catalyst as well as interpretation of reaction rate laws for the discussion and design of reaction mechanisms (including photochemistry).																																					
References	Main :																																					
	1. Wilkinson, Frank. 1975. Chemical Kinetics and Reaction Mechanisms. Victoria: Van Nostrand Reinhold Company. 2. Atkins, P. W. 1995. Physical Chemistry. Third Edition. New York: W. H. Freeman and Company. 3. Castelan, Gilbert W. 1983. Physical Chemistry. Third Edition. Tokyo: Addison-Wesley Publishing Company.																																					
	Supporters:																																					
Supporting lecturer	Prof. Dr. Suyono, M.Pd. Bertha Yonata, S.Pd., M.Pd.																																					
Week-	Final abilities of each learning stage (Sub-PO)	Evaluation		Help Learning, Learning methods, Student Assignments, [Estimated time]		Learning materials [References]	Assesment Weight (%)																															
		Indicator	Criteria & Form	Offline (offline)	Online (online)																																	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)																															

1	Understand the physical meaning of the reaction rate law.	Formulate the reaction rate law, if given data on the function of concentration versus time.	Criteria: 1. The assessment is carried out on the following aspects: 2.1. Participation during lectures, carried out through observation (weight 2) 3.2. UTS and UAS, carried out once, assessing all relevant indicators through a written exam, averaged and weighted (2) 4.3. Tasks are weighted (3) 5.4. The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10	Practice transforming and interpreting differential form equations into integral form for the zeroth power to the nth power Discussion 3 X 50			0%
2	Understand the physical meaning of the reaction rate law.	Formulate the reaction rate law, if given data on the function of concentration versus time.	Criteria: 1. The assessment is carried out on the following aspects: 2.1. Participation during lectures, carried out through observation (weight 2) 3.2. UTS and UAS, carried out once, assessing all relevant indicators through a written exam, averaged and weighted (2) 4.3. Tasks are weighted (3) 5.4. The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10	Practice transforming and interpreting differential form equations into integral form for the zeroth power to the nth power Discussion 3 X 50			0%
3	Understand the physical meaning of the reaction rate law.	Formulate the reaction rate law, if given data on the function of concentration versus time.	Criteria: 1. The assessment is carried out on the following aspects: 2.1. Participation during lectures, carried out through observation (weight 2) 3.2. UTS and UAS, carried out once, assessing all relevant indicators through a written exam, averaged and weighted (2) 4.3. Tasks are weighted (3) 5. The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10	Practice determining the reaction order based on concentration function data over time. Practice determining the reaction rate law based on concentration data 3 X 50			0%

4	Understand the physical meaning of the reaction rate law.	Use the rate law to predict the rate of a reaction at another known concentration.	Criteria: 1.The assessment is carried out on the following aspects: 2.Participation during lectures is carried out through observation (weight 2)UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2)Assignments are given a weight (3)The final NA is (participation value x2) (Assignment score x 3) (UTS score x 2) UAS score (3) divided by 10	Practice predicting reaction rates at other known concentrations. 3 X 50			0%
5	Understand the physical meaning of the reaction rate law.	Use the rate law to predict the reaction rate at other known concentrations.	Criteria: 1.The assessment is carried out on the following aspects: 2.Participation during lectures is carried out through observation (weight 2)UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2)Assignments are given a weight (3)The final NA is (participation value x2) (Assignment score x 3) (UTS score x 2) UAS score (3) divided by 10	Practice predicting the reaction rate at other known concentrations and calculating the value of k 3 X 50			0%
6	Understand the physical meaning of the reaction rate function against reaction temperature.	1.Using Arrhenius' law to analyze data (more than two) k functions on temperature. 2.Using Arrhenius' law to analyze data (two data) on the function of k on temperature.	Criteria: 1.The assessment is carried out on the following aspects: 2.Participation during lectures is carried out through observation (weight 2)UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2)Assignments are given a weight (3)The final NA is (participation value x2) (Assignment score x 3) (UTS score x 2) UAS score (3) divided by 10	discussion and practice questions 3 X 50			0%

7	Understand the physical meaning of the reaction rate function on a catalyst.	Using Arrhenius' law to predict changes in reaction rates due to the addition of a catalyst at a certain temperature.	Criteria: 1.The assessment is carried out on the following aspects: 2.Participation during lectures is carried out through observation (weight 2)UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2)Assignments are given a weight (3)The final NA is (participation value x2) (Assignment score x 3) (UTS score x 2) UAS score (3) divided by 10	Presentation and discussion 3 X 50			0%
8	UTS	1.Formulate the reaction rate law, if given data on the function of concentration versus time. 2.Formulate the reaction rate law, if given data on the function of concentration versus time. 3.Formulate the reaction rate law, if given data on the function of concentration versus time. 4.Use the rate law to predict the rate of a reaction at another known concentration. 5.Use the rate law to predict the reaction rate at other known concentrations 6.Using Arrhenius' law to analyze data (more than two) k functions on temperature. 7.Using Arrhenius' law to analyze data (two data) on the function of k on temperature. 8.Using Arrhenius' law to predict changes in reaction rates due to the addition of a catalyst at a certain temperature.	Criteria: 1.The assessment is carried out on the following aspects: 2.Participation during lectures is carried out through observation (weight 2)UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2)Assignments are given a weight (3)The final NA is (participation value x2) (Assignment score x 3) (UTS score x 2) UAS score (3) divided by 10	3 X 50			0%

9	Understand how to determine mechanisms using the reaction kinetics approach.	Testing the correctness of the reaction mechanism design, both simple reactions and complex (chain) reactions.	Criteria: 1.The assessment is carried out on the following aspects: 2.Participation during lectures is carried out through observation (weight 2)UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2)Assignments are given a weight (3)The final NA is (participation value x2) (Assignment score x 3) (UTS score x 2) UAS score (3) divided by 10	Discussion and practice questions 3 X 50			0%
10	Understand how to determine mechanisms using the reaction kinetics approach.	Testing the correctness of the reaction mechanism design, both simple reactions and complex (chain) reactions.	Criteria: 1.The assessment is carried out on the following aspects: 2.Participation during lectures is carried out through observation (weight 2)UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2)Assignments are given a weight (3)The final NA is (participation value x2) (Assignment score x 3) (UTS score x 2) UAS score (3) divided by 10	Discussion and practice questions 3 X 50			0%
11	Understand how to determine mechanisms using the reaction kinetics approach.	1.Testing the correctness of the reaction mechanism design, both simple reactions and complex (chain) reactions. 2.Testing quantitative measures to gain advantages in implementing the chain length concept.	Criteria: 1.The assessment is carried out on the following aspects: 2.Participation during lectures is carried out through observation (weight 2)UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2)Assignments are given a weight (3)The final NA is (participation value x2) (Assignment score x 3) (UTS score x 2) UAS score (3) divided by 10	discussion and practice questions 3 X 50			0%

12	Understand how to determine mechanisms using the reaction kinetics approach.	<ol style="list-style-type: none"> 1. Testing quantitative measures to gain advantages in implementing the chain length concept. 2. Determining alignment with ideas about reaction mechanisms. 	Criteria: <ol style="list-style-type: none"> 1. The assessment is carried out on the following aspects: 2. Participation during lectures is carried out through observation (weight 2) UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2) Assignments are given a weight (3) The final NA is (participation value x2) (Assignment score x 3) (UTS score x 2) UAS score (3) divided by 10 	Discussion and practice questions 3 X 50			0%
13	Understand the mechanisms for homogeneous catalytic reactions in solution.	<ol style="list-style-type: none"> 1. Evaluate the types of activated complexes in the Herzfeld mechanism (general homogeneous catalytic reactions in solution). 2. Evaluating the Arrhenius complex type Herzfeld mechanism for the case of extremely different substrate and catalyst concentrations. 	Criteria: <ol style="list-style-type: none"> 1. The assessment is carried out on the following aspects: 2. Participation during lectures is carried out through observation (weight 2) UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2) Assignments are given a weight (3) The final NA is (participation value x2) (Assignment score x 3) (UTS score x 2) UAS score (3) divided by 10 	Presentation and discussion 3 X 50			0%
14	Understand the mechanisms of acid or base catalyzed reactions.	<ol style="list-style-type: none"> 1. Determine the intermediate and solvent species for different types of catalyst (strong acid, weak acid, strong base, or weak base). 2. Distinguish between protolytic type and prototropic type acid catalysis mechanisms. 	Criteria: <ol style="list-style-type: none"> 1. The assessment is carried out on the following aspects: 2. Participation during lectures is carried out through observation (weight 2) UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2) Assignments are given a weight (3) The final NA is (participation value x2) (Assignment score x 3) (UTS score x 2) UAS score (3) divided by 10 	Discussion and practice questions 1 X 1			0%

15	Understand the mechanisms of acid or base catalyzed reactions.	Distinguish between specific protolytic type and general protolytic type base catalysis mechanisms.	Criteria: 1.The assessment is carried out on the following aspects: 2.Participation during lectures is carried out through observation (weight 2)UTS and UAS, carried out once by assessing all relevant indicators through written examinations, averaged and given a weight (2)Assignments are given a weight (3)The final NA is (participation value x2) (Assignment score x 3) (UTS score x 2) UAS score (3) divided by 10	Discussion and practice questions 3 X 50			0%
16	UAS	UAS	Criteria: UAS has a weight of 3	UAS 3 X 50			0%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
		0%

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.