



Universitas Negeri Surabaya
Faculty of Mathematics and Natural Sciences
Bachelor of Science Education Study Program

Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight	SEMESTER	Compilation Date																																																																																			
General Chemistry	8420103074		T=3 P=0 ECTS=4.77	1	July 18, 2024																																																																																			
AUTHORIZATION	SP Developer		Course Cluster Coordinator	Study Program Coordinator																																																																																				
	Prof. Dr. Erman, M.Pd.																																																																																				
Learning model	Project Based Learning																																																																																							
Program Learning Outcomes (PLO)	PLO study program that is charged to the course																																																																																							
	PLO-5	Demonstrate scientific, critical, and innovative attitudes in integrated science learning, laboratory activities, and professional-related tasks																																																																																						
	PLO-8	Make decisions based on data/information in order to complete tasks and evaluate the performance that has been done																																																																																						
	PLO-12	Demonstrate basic knowledge of physics, chemistry, and biology																																																																																						
	Program Objectives (PO)																																																																																							
	PO - 1	Mastering basic chemical concepts to solve problems related to chemistry.																																																																																						
	PO - 2	Make decisions about the relationship between basic chemistry concepts and knowledge according to the study program.																																																																																						
	PO - 3	Able to demonstrate a scientific attitude in appropriate laboratory activities																																																																																						
	PLO-PO Matrix																																																																																							
		<table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <thead> <tr> <th>P.O</th> <th>PLO-5</th> <th>PLO-8</th> <th>PLO-12</th> </tr> </thead> <tbody> <tr> <td>PO-1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>PO-2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>PO-3</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>				P.O	PLO-5	PLO-8	PLO-12	PO-1				PO-2				PO-3																																																																						
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Short Course Description	This course discusses the application of various learning resources, learning media, and appropriate laboratory activities to support mastery of concepts: Scientific Method, Properties of Matter, Stoichiometry, Periodic System of Elements, Chemical Bonding, State of Matter, Energetics, Solutions, Colloidal Systems, Chemistry Carbon and Biochemistry, Everyday Chemicals, as well as instilling an attitude of being brave in making decisions, honest and responsible. Learning is presented in the form of theory, practical work and assignments.																																																																																							
References	Main :																																																																																							
	1. Tim Kimia Umum. 2013. Kimia Umum . Surabaya: Jurusan Kimia FMIPA Unesa. 2. Brady, James.E. 2004 . General Chemistry. Principle and Structure. 4th . ed. New York. John Willey and Sons, Inc. 3. Chang, Raymond. 2005. General Chemistry The Essential Concepts Third Edition. USA: McGraw Hill.																																																																																							
	Supporters:																																																																																							
Supporting lecturer	Dra. Martini, M.Pd. Prof. Dr. Erman, M.Pd. Dr. Siti Nurul Hidayati, S.Pd., M.Pd. Beni Setiawan, S.Pd., M.Pd., Ph.D. Wahyu Budi Sabtiawan, S.Si., M.Pd.,M.Sc. Ernita Vika Aulia, 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]	Assessment Weight (%)
		Indicator	Criteria & Form	Offline (offline)	Online (online)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Explain the definition of material and material classification; Mention examples of each type of material in everyday life; Distinguish between elements, compounds, and mixtures; Explain the relationship between elements, compounds, and mixtures; Evaluate a phenomenon/case related to the topic material and its classification; Apply the concepts of elements, compounds and mixtures in laboratory practical activities	<ol style="list-style-type: none"> 1.Students can explain the definition of material and material classification. 2.Students can mention examples of each type of material in everyday life. 3.Students can differentiate between elements, compounds and mixtures. 4.Students can explain the relationship between elements, compounds and mixtures. 5.Students can evaluate a phenomenon/case related to the topic material and its classification. 6.Students can apply the concepts of elements, compounds and mixtures in laboratory practical activities. 	<p>Criteria: Accuracy and mastery according to assessment indicators (assessment rubric)</p> <p>Form of Assessment : Participatory Activities, Practical Assessment</p>	Case based learning and discussion 3 x 50'	Case based learning and discussions via online/virtual applications or UNESA LMS. 3 x 50'	<p>Material: Materials and their Classification Library: <i>General Chemistry Team. 2013. General Chemistry. Surabaya: Chemistry Department, FMIPA Unesa.</i></p> <p>Material: Material and Classification References: <i>Brady, James.E. 2004 . General Chemistry. Principles and Structure. 4th . ed. New York. John Willey and Sons, Inc.</i></p> <p>Material: Material and its Classification Reference: <i>Chang, Raymond. 2005. General Chemistry The Essential Concepts Third Edition. USA: McGraw Hill.</i></p> <p>Material: Material and Classification Literature: <i>Articles related to contextual phenomena/cases</i></p>	10%
2	Explain the definition of material and material classification; Mention examples of each type of material in everyday life; Distinguish between elements, compounds, and mixtures; Explain the relationship between elements, compounds, and mixtures; Evaluate a phenomenon/case related to the topic material and its classification; Apply the concepts of elements, compounds and mixtures in laboratory practical activities	<ol style="list-style-type: none"> 1.Students can explain the definition of material and material classification. 2.Students can mention examples of each type of material in everyday life. 3.Students can differentiate between elements, compounds and mixtures. 4.Students can explain the relationship between elements, compounds and mixtures. 5.Students can evaluate a phenomenon/case related to the topic material and its classification. 6.Students can apply the concepts of elements, compounds and mixtures in laboratory practical activities. 	<p>Criteria: Accuracy and mastery according to assessment indicators (assessment rubric)</p> <p>Form of Assessment : Participatory Activities, Practical Assessment</p>	Case based learning and discussion 3 x 50'	Case based learning and discussions via online/virtual applications or UNESA LMS. 3 x 50'	<p>Material: Materials and their Classification Library: <i>General Chemistry Team. 2013. General Chemistry. Surabaya: Chemistry Department, FMIPA Unesa.</i></p> <p>Material: Material and Classification References: <i>Brady, James.E. 2004 . General Chemistry. Principles and Structure. 4th . ed. New York. John Willey and Sons, Inc.</i></p> <p>Material: Material and its Classification Reference: <i>Chang, Raymond. 2005. General Chemistry The Essential Concepts Third Edition. USA: McGraw Hill.</i></p> <p>Material: Material and Classification Literature: <i>Articles related to contextual phenomena/cases</i></p>	10%

3	<p>Explain the definition of material and material classification; Mention examples of each type of material in everyday life; Distinguish between elements, compounds, and mixtures; Explain the relationship between elements, compounds, and mixtures; Evaluate a phenomenon/case related to the topic material and its classification; Apply the concepts of elements, compounds and mixtures in laboratory practical activities</p>	<ol style="list-style-type: none"> 1. Students can explain the definition of material and material classification. 2. Students can mention examples of each type of material in everyday life. 3. Students can differentiate between elements, compounds and mixtures. 4. Students can explain the relationship between elements, compounds and mixtures. 5. Students can evaluate a phenomenon/case related to the topic material and its classification. 6. Students can apply the concepts of elements, compounds and mixtures in laboratory practical activities. 	<p>Criteria: Accuracy and mastery according to assessment indicators (assessment rubric)</p> <p>Form of Assessment : Participatory Activities, Practical Assessment</p>	<p>Case based learning and discussion 3 x 50'</p>	<p>Case based learning and discussions via online/virtual applications or UNESA LMS. 3 x 50'</p>	<p>Material: Materials and their Classification Library: <i>General Chemistry Team. 2013. General Chemistry. Surabaya: Chemistry Department, FMIPA Unesa.</i></p> <hr/> <p>Material: Material and Classification References: <i>Brady, James.E. 2004 . General Chemistry. Principles and Structure. 4th . ed. New York. John Willey and Sons, Inc.</i></p> <hr/> <p>Material: Material and its Classification Reference: <i>Chang, Raymond. 2005. General Chemistry The Essential Concepts Third Edition. USA: McGraw Hill.</i></p> <hr/> <p>Material: Material and Classification Literature: <i>Articles related to contextual phenomena/cases</i></p>	10%
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5	<p>Explain the history of atomic theory; Explaining Modern Atomic Theory; Explain the concept of ions and molecules; Explain the concept of molecular and empirical formulas; Write down the electron configuration; Explain the concept of periodicity of elements; Calculating effective core charge and shielding effect; Evaluate a phenomenon/case related to the topic of atoms, ions and molecules</p>	<ol style="list-style-type: none"> 1.Students can explain the history of atomic theory. 2.Students can explain Modern Atomic Theory. 3.Students can explain the concepts of ions and molecules. 4.Students can explain the concept of molecular and empirical formulas. 5.Students can write electron configurations. 6.Students can explain the concept of periodicity of elements. 7.Students can evaluate a phenomenon/case related to the topic of atoms, ions and molecules. 	<p>Criteria: Accuracy and mastery according to assessment indicators (assessment rubric)</p> <p>Form of Assessment : Participatory Activities</p>	<p>Case based learning and discussion 3 x 50'</p>	<p>Case based learning and discussions via online/virtual applications or UNESA LMS. 3 x 50'</p>	<p>Material: Atoms, Ions, Molecules Library: <i>General Chemistry Team. 2013. General Chemistry. Surabaya: Chemistry Department, FMIPA Unesa.</i></p> <hr/> <p>Material: Atoms, Ions, Molecules Library: <i>Brady, James.E. 2004 . General Chemistry. Principles and Structure. 4th . ed. New York. John Willey and Sons, Inc.</i></p> <hr/> <p>Material: Atoms, Ions, Molecules Library: <i>Chang, Raymond. 2005. General Chemistry The Essential Concepts Third Edition. USA: McGraw Hill.</i></p> <hr/> <p>Material: Atoms, Ions, Molecules Library: <i>Articles related to contextual phenomena/cases</i></p>	10%
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7	Describe chemical bonds (ionic, covalent, metallic); Describe chemical forces (Van der Waals bonds)	<ol style="list-style-type: none"> Students can describe chemical bonds (ionic, covalent, metallic). Students can describe chemical forces (Van der Waals bonds). Students can evaluate a phenomenon/case related to the topic of chemical bonds. 	<p>Criteria: Accuracy and mastery according to assessment indicators (assessment rubric)</p> <p>Form of Assessment : Participatory Activities</p>	Case based learning and discussion 3 x 50'	Case based learning and discussions via online/virtual applications or UNESA LMS. 3 x 50'	<p>Material: Chemical Bonds Library: <i>General Chemistry Team. 2013. General Chemistry. Surabaya: Chemistry Department, FMIPA Unesa.</i></p> <hr/> <p>Material: Chemical Bonds References: <i>Brady, James.E. 2004 . General Chemistry. Principles and Structure. 4th . ed. New York. John Willey and Sons, Inc.</i></p> <hr/> <p>Material: Chemical Bonds References: <i>Chang, Raymond. 2005. General Chemistry The Essential Concepts Third Edition. USA: McGraw Hill.</i></p> <hr/> <p>Material: Chemical Bonds Literature: <i>Articles related to contextual phenomena/cases</i></p>	10%
8		Assessment indicators from Meetings 1 to 7	<p>Criteria: Accuracy and mastery according to assessment indicators (assessment rubric)</p>	UTS (Paper-pencil test) 2 x 50'	UTS (Paper-pencil test via online application/LMS UNESA) 2 x 50'		0%
9	Explain the basic laws of chemistry: Law of Conservation of Mass, Fixed Proportions, Multiple Proportions, Reciprocal Proportions, Volume Comparisons, Avogadro; Perform calculations based on stoichiometry concepts; Evaluate a phenomenon/case related to the Stoichiometry Topic; Apply the concept of stoichiometry based on related laws in laboratory practical activities	<ol style="list-style-type: none"> Students can explain the basic laws of chemistry: Law of Conservation of Mass, Fixed Ratios, Multiple Ratios, Reciprocal Ratios, Volume Ratios, Avogadro. Students can carry out calculations based on the concept of stoichiometry. Students can evaluate a phenomenon/case related to the Stoichiometry Topic. 	<p>Criteria: Accuracy and mastery according to assessment indicators (assessment rubric)</p> <p>Form of Assessment : Participatory Activities, Practical Assessment</p>	Case based learning and discussion 3 x 50'	Case based learning and discussions via online/virtual applications or UNESA LMS. 3 x 50'	<p>Material: Stoichiometry Library: <i>General Chemistry Team. 2013. General Chemistry. Surabaya: Chemistry Department, FMIPA Unesa.</i></p> <hr/> <p>Material: Stoichiometry Bibliography: <i>Brady, James.E. 2004 . General Chemistry. Principles and Structure. 4th . ed. New York. John Willey and Sons, Inc.</i></p> <hr/> <p>Material: Stoichiometry Bibliography: <i>Chang, Raymond. 2005. General Chemistry The Essential Concepts Third Edition. USA: McGraw Hill.</i></p> <hr/> <p>Material: Stoichiometry Literature: <i>Articles related to contextual phenomena/cases</i></p>	10%

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11	<p>Explain the basic laws of chemistry: Law of Conservation of Mass, Fixed Proportions, Multiple Proportions, Reciprocal Proportions, Volume Comparisons, Avogadro; Perform calculations based on stoichiometry concepts; Evaluate a phenomenon/case related to the Stoichiometry Topic; Apply the concept of stoichiometry based on related laws in laboratory practical activities</p>	<ol style="list-style-type: none"> 1.Students can explain the basic laws of chemistry: Law of Conservation of Mass, Fixed Ratios, Multiple Ratios, Reciprocal Ratios, Volume Ratios, Avogadro. 2.Students can carry out calculations based on the concept of stoichiometry. 3.Students can evaluate a phenomenon/case related to the Stoichiometry Topic. 	<p>Criteria: Accuracy and mastery according to assessment indicators (assessment rubric)</p> <p>Form of Assessment : Participatory Activities, Practical Assessment</p>	<p>Case based learning and discussion 3 x 50'</p>	<p>Case based learning and discussions via online/virtual applications or UNESA LMS. 3 x 50'</p>	<p>Material: Stoichiometry Library: <i>General Chemistry Team. 2013. General Chemistry. Surabaya: Chemistry Department, FMIPA Unesa.</i></p> <hr/> <p>Material: Stoichiometry Bibliography: <i>Brady, James.E. 2004 . General Chemistry. Principles and Structure. 4th . ed. New York. John Willey and Sons, Inc.</i></p> <hr/> <p>Material: Stoichiometry Bibliography: <i>Chang, Raymond. 2005. General Chemistry The Essential Concepts Third Edition. USA: McGraw Hill.</i></p> <hr/> <p>Material: Stoichiometry Literature: <i>Articles related to contextual phenomena/cases</i></p>	10%

12	<p>Explain the basic terms of solubility and solubility requirements through calculating the solubility product; Explain the basic terms of Acid-Base and the basic concept of Acid-Base based on Arhenius, Bronsted-Lowry, and Lewis; Explain the basic terms of colligative properties; Explain the basic terms of a buffer solution and the requirements for a solution to be called a buffer solution; Explain the basic terms of solution hydrolysis; Evaluate a phenomenon/case related to the Solution Topic; Apply basic acid-base concepts in laboratory practical activities</p>	<ol style="list-style-type: none"> Students can explain the basic terms of solubility and solubility requirements through calculating the solubility product. Students can explain the basic terms of Acid-Base as well as the basic concepts of Acid-Base based on Arhenius, Bronsted-Lowry, and Lewis. Students can explain the basic terms of colligative properties. Students can explain the basic terms of buffer solutions and the conditions for a solution to be called a buffer solution. Students can explain the basic terms of solution hydrolysis. Students can evaluate a phenomenon/case related to the Solution Topic. Students can apply basic acid-base concepts in laboratory practical activities. 	<p>Criteria: Accuracy and mastery according to assessment indicators (assessment rubric)</p> <p>Form of Assessment : Participatory Activities, Practical Assessment</p>	<p>Case based learning and discussion 3 x 50'</p>	<p>Case based learning and discussions via online/virtual applications or UNESA LMS. 3 x 50'</p>	<p>Material: Basic Concepts of Solutions Library: <i>General Chemistry Team. 2013. General Chemistry. Surabaya: Chemistry Department, FMIPA Unesa.</i></p> <hr/> <p>Material: Basic Concepts of Solutions References: <i>Brady, James.E. 2004 . General Chemistry. Principles and Structure. 4th . ed. New York. John Willey and Sons, Inc.</i></p> <hr/> <p>Material: Basic Concepts of Solutions References: <i>Chang, Raymond. 2005. General Chemistry The Essential Concepts Third Edition. USA: McGraw Hill.</i></p> <hr/> <p>Material: Basic Concepts of Solutions Literature: <i>Articles related to contextual phenomena/cases</i></p>	10%
13	<p>Explain the basic terms of solubility and solubility requirements through calculating the solubility product; Explain the basic terms of Acid-Base and the basic concept of Acid-Base based on Arhenius, Bronsted-Lowry, and Lewis; Explain the basic terms of colligative properties; Explain the basic terms of a buffer solution and the requirements for a solution to be called a buffer solution; Explain the basic terms of solution hydrolysis; Evaluate a phenomenon/case related to the Solution Topic; Apply basic acid-base concepts in laboratory practical activities</p>	<ol style="list-style-type: none"> Students can explain the basic terms of solubility and solubility requirements through calculating the solubility product. Students can explain the basic terms of Acid-Base as well as the basic concepts of Acid-Base based on Arhenius, Bronsted-Lowry, and Lewis. Students can explain the basic terms of colligative properties. Students can explain the basic terms of buffer solutions and the conditions for a solution to be called a buffer solution. Students can explain the basic terms of solution hydrolysis. Students can evaluate a phenomenon/case related to the Solution Topic. Students can apply basic acid-base concepts in laboratory practical activities. 	<p>Criteria: Accuracy and mastery according to assessment indicators (assessment rubric)</p> <p>Form of Assessment : Participatory Activities, Practical Assessment</p>	<p>Case based learning and discussion 3 x 50'</p>	<p>Case based learning and discussions via online/virtual applications or UNESA LMS. 3 x 50'</p>	<p>Material: Basic Concepts of Solutions Library: <i>General Chemistry Team. 2013. General Chemistry. Surabaya: Chemistry Department, FMIPA Unesa.</i></p> <hr/> <p>Material: Basic Concepts of Solutions References: <i>Brady, James.E. 2004 . General Chemistry. Principles and Structure. 4th . ed. New York. John Willey and Sons, Inc.</i></p> <hr/> <p>Material: Basic Concepts of Solutions References: <i>Chang, Raymond. 2005. General Chemistry The Essential Concepts Third Edition. USA: McGraw Hill.</i></p> <hr/> <p>Material: Basic Concepts of Solutions Literature: <i>Articles related to contextual phenomena/cases</i></p>	10%

14	<p>Explain basic energetic terms such as enthalpy, entropy, and GIBS free energy; Explain the basic concepts of redox and reaction equations; Evaluate a phenomenon/case related to the topic of energetics</p>	<ol style="list-style-type: none"> 1.Students can explain basic energetic terms such as enthalpy, entropy, and gibs free energy. 2.Students can explain the basic concepts of redox and reaction equations. 3.Students can evaluate a phenomenon/case related to the topic of energetics. 	<p>Criteria: Accuracy and mastery according to assessment indicators (assessment rubric)</p> <p>Form of Assessment : Participatory Activities</p>	<p>Case based learning and discussion 3 x 50'</p>	<p>Case based learning and discussions via online/virtual applications or UNESA LMS. 3 x 50'</p>	<p>Material: Energetics Library: <i>General Chemistry Team. 2013. General Chemistry. Surabaya: Chemistry Department, FMIPA Unesa.</i></p> <hr/> <p>Material: Energetics Bibliography: <i>Brady, James.E. 2004 . General Chemistry. Principles and Structure. 4th . ed. New York. John Willey and Sons, Inc.</i></p> <hr/> <p>Material: Energetics References: <i>Chang, Raymond. 2005. General Chemistry The Essential Concepts Third Edition. USA: McGraw Hill.</i></p> <hr/> <p>Material: Energetics Literature: <i>Articles related to contextual phenomena/cases</i></p>	10%
15	<p>Explain the concept of carbon compounds; Describe the structure of carbohydrates, fats and proteins; Evaluate a phenomenon/case related to the Biochemistry Topic</p>	<ol style="list-style-type: none"> 1.Students can explain the concept of carbon compounds. 2.Students can describe the structure of carbohydrates, fats and proteins. 3.Students can evaluate a phenomenon/case related to the Biochemistry Topic. 	<p>Criteria: Accuracy and mastery according to assessment indicators (assessment rubric)</p> <p>Form of Assessment : Participatory Activities</p>	<p>Case based learning and discussion 3 x 50'</p>	<p>Case based learning and discussions via online/virtual applications or UNESA LMS. 3 x 50'</p>	<p>Material: Biochemical Aspects Library: <i>General Chemistry Team. 2013. General Chemistry. Surabaya: Chemistry Department, FMIPA Unesa.</i></p> <hr/> <p>Material: Biochemical Aspects References: <i>Brady, James.E. 2004 . General Chemistry. Principles and Structure. 4th . ed. New York. John Willey and Sons, Inc.</i></p> <hr/> <p>Material: Biochemical Aspects References: <i>Chang, Raymond. 2005. General Chemistry The Essential Concepts Third Edition. USA: McGraw Hill.</i></p> <hr/> <p>Material: Biochemical Aspects Literature: <i>Articles related to contextual phenomena/cases</i></p>	10%
16		<p>Assessment indicators from Meetings 9 to 15</p>	<p>Criteria: Accuracy and mastery according to assessment indicators (assessment rubric)</p>	<p>UAS (Paper-pencil test) 2 x 50'</p>	<p>UAS (Paper-pencil test via online application/LMS UNESA) 2 x 50'</p>		0%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	95%
2.	Practical Assessment	45%
		100%

Notes

1. **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.
2. **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.
3. **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.
4. **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.
5. **Indicators for assessing** abilities in the process and student learning outcomes are specific and measurable statements that identify the abilities or performance of student learning outcomes accompanied by evidence.
6. **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.
7. **Forms of assessment:** test and non-test.
8. **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.