	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
Elemental Chemistry	8420403325		T=3	P=0	ECTS=4.77	4	January 3, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
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Learning model	**Case Studies**	
Program Learning Outcomes (PLO)	**PLO study program which is charged to the course**	
	PLO-6	Able to adapt to various developments in chemical science, continue to develop and learn throughout life to continue education, both formal and informal (CPL 8)
	PLO-8	Mastering the basics of scientific methods, designing and carrying out research, compiling scientific reports and communicating them both orally and in writing by utilizing information and communication technology in the field of education (CPL 6)
	PLO-9	Mastering the principles of K3 (Work Safety and Security), managing the laboratory and using its equipment as well as how to operate chemical instruments (CPL 3)
	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	Mastering theoretical concepts about the structure, dynamics and energy of chemicals, as well as the basic principles of separation, analysis, synthesis and characterization of main group elements.
	PO - 2	Able to produce appropriate conclusions based on the results of identification, analysis, isolation, transformation and synthesis of chemical substances that have been carried out
	PO - 3	Able to solve scientific, technological and artistic problems in the general field of chemistry and in a simple scope including identification, analysis, isolation, transformation and synthesis of micromolecules through the application of knowledge about structure, dynamics and energy, as well as the application of relevant technology
	PO - 4	Have a sense of majesty towards God's creation in the form of main group elements
	PO - 5	Utilize learning resources and ICT to support mastery of Inorganic Chemistry concepts and theories
	PO - 6	Have knowledge of the basic concepts of metal extraction, physical and chemical properties of elements and transition compounds of the first, second and third series of block d
	PO - 7	Making decisions in linking the concepts of periodicity of elemental properties with the basic concepts of metal extraction, physical and chemical properties of elements and transition compounds of the first, second and third series of block d
	PO - 8	Have an honest and responsible attitude in studying inorganic chemistry concepts
	PLO-PO Matrix	

P.O	PLO-6	PLO-8	PLO-9	PLO-11
PO-1				
PO-2				
PO-3				
PO-4				
PO-5				
PO-6				
PO-7				
PO-8				

PO Matrix at the end of each learning stage (Sub-PO)

P.O	Week															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PO-1																
PO-2																
PO-3																
PO-4																
PO-5																
PO-6																
PO-7																
PO-8																

Short Course Description	Study of abundance, properties, how to obtain, benefits and how to identify and be able to utilize elements and their compounds from the main group elements and transition elements, first, second and third series of block d through discussions, presentations, project assignments, conveying ideas orally or written
References	**Main :**
	1. Lee, J.D. 1991. Concise Inorganic Chemistry . Four Edition. London: Chapman & Hall. 2. Madan, R.D. 1997. Modern Inorganic Chemistry . New Delhi: S. Chand and Company LDT. 3. Sugiarto, B. dkk. 1997. Kimia Anorganik . Surabaya: Unipress IKIP Surabaya. 4. Perry, Dale L. 2011. Handbook of Inorganic Compounds, Second Edition (Hardcover) – May 18, 2011. ISBN-13: 000-1439814619 ISBN-10: 14398146 5. Jurnal ilmiah
	Supporters:
Supporting lecturer	Prof. Dr. Achmad Lutfi, M.Pd. Dr. Muchlis, S.Pd., M.Pd. Dr. Kusumawati Dwiningsih, S.Pd., M.Pd. Rusly Hidayah, S.Si., M.Pd. Dr. Dina Kartika Maharani, S.Si., M.Sc. Amalia Putri Purnamasari, S.Si., 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	1.Students understand the discussion of inorganic chemistry and the role of theory in inorganic chemistry as well as the basis for classifying elements 2.Students understand the position, physico-chemical properties, laboratory production of hydrogen compounds and their benefits	1.Understand the basic classification of elements 2.Explain the role of chemical theory in inorganic chemistry 3.Understand the position, properties, uses of hydrogen and its compounds. 4.Understand how to make hydrogen and its compounds in laboratories and industrially	**Criteria:** 1.1. Participation during lectures (weight 2) 2.2. Assignment value for working on questions and writing papers (weight 2) **Form of Assessment** : Participatory Activities, Portfolio Assessment	Discussion, Questions and Answers and Presentation 3 X 50		**Material:** Introduction to Elemental Chemistry **Bibliography:** *Lee, JD 1991. Concise Inorganic Chemistry. Four Edition. London: Chapman & Hall.*	7%

2	1.Students understand the position, physico-chemical properties, laboratory preparation of alkaline compounds and their benefits. 2.Students understand the position, physico-chemical properties, laboratory preparation of alkaline compounds and their benefits	1.Understand the position, properties, methods of obtaining alkali metals. 2.Explain the uses of alkaline compounds based on their properties	**Criteria:** 1.1. Participation during lectures (weight 2) 2.2. Assignment value for working on questions and writing papers (weight 2) **Form of Assessment** : Participatory Activities	Discussion, Q&A and presentation 3 X 50		**Material:** Hydrogen and its compounds a. Position in the periodic table b. Physical and chemical properties c. Hydrogen isotope d. Hybrids of the Water element and related things. **References:**	8%
3	1.Students understand the position, physico-chemical properties, laboratory preparation of alkaline earth compounds and their benefits. 2.Students understand the position of physico-chemical properties, laboratory production of boron and aluminum compounds and their benefits.	1.Understand the position, properties, methods of obtaining alkaline earth metals 2.Explain the uses of alkaline earth compounds. 3.Understand the position, nature, and method of obtaining group IIIA. 4.Explain the uses of Aluminum and Boron compounds	**Criteria:** 1.1. Participation during lectures (weight 2) 2.2. Assignment value for working on questions and writing papers (weight 2) **Form of Assessment** : Participatory Activities	Discussion, Presentation and Questions and Answers 3 X 50			5%
4	1.Students understand the position of physico-chemical properties, laboratory manufacture and boron and aluminum compounds and their benefits 2.Students understand the position, physico-chemical properties, laboratory production of carbon compounds and their benefits	1.Understand how to make Boron and Aluminum compounds in a laboratory. 2.Understand the position, properties, and methods of obtaining carbon groups.	**Criteria:** 1.1. Participation during lectures (weight 2) 2.2. Assignment value for working on questions and writing papers (weight 2) **Form of Assessment** : Participatory Activities, Portfolio Assessment	Discussion, presentation and question and answer 3 X 50			5%

5	1. Students understand the position, physico-chemical properties, laboratory production of carbon compounds and their benefits 2. Students understand the position, physico-chemical properties, laboratory production of nitrogen compounds and their benefits	1. Explain the uses of carbon compounds 2. Understand how to make carbide compounds in the laboratory. 3. Understand the position, properties, and methods of obtaining the nitrogen group. 4. Explain the uses of nitrogen compounds 5. Understand how to make nitrogen, antimony and arsenic compounds in the laboratory	**Criteria:** Participation during lectures is carried out through observation (weight 2) **Form of Assessment** : Participatory Activities	3 X 50			5%
6	1. Students understand the position, physical and chemical properties, laboratory production of oxygen and sulfur compounds and their benefits 2. Students understand the position, physical and chemical properties, laboratory production and the benefits of halogen compounds	1. Understand the position, properties and methods of obtaining oxygen and sulfur 2. Explain the benefits of oxygen and sulfur compounds based on their properties 3. Understand the position, properties and methods of obtaining halogen group elements 4. Explain the benefits of flour and iodine compounds based on their properties	**Criteria:** Participation during lectures is carried out through observation (weight 2) **Form of Assessment** : Participatory Activities	Case Method, Lectures and discussions, Assignments. 150 minutes	- 0		7%
7	1. Students understand the position, physical and chemical properties, laboratory production of noble gases 2. Students understand the position, physicochemical properties, and laboratory production of noble gases	1. Understand the characteristics of the noble gas group 2. Explain the benefits of noble gases based on their properties	**Criteria:** 1. 1. Participation during lectures, carried out through observation (weight 2) 2. 2. Report/paper product assessment, as an assignment, with weight (3) **Form of Assessment** : Participatory Activities, Portfolio Assessment	Case Method, Lectures and discussions, Assignments. 150 minutes			8%
8	Midterm exam	Midterm exam	**Criteria:** The Mid-Semester Examination (UTS) is carried out assessing all relevant indicators through a written exam, with a weight of (2) **Form of Assessment** : Test	Written test 3x50'			0%
9	1. Understand the	1. Write down	**Criteria:**	Case			5%

	principles of extraction of metals 2.Understand the physical and chemical properties of transition elements	the principles of extraction of transition metal elements 2.Write down the extraction reactions of transition metal elements 3.Define the term transition element 4.Write the electronic configuration of the transition elements 5.Explain the characteristics of transition elements 6.Explains the phenomenon of irregular sizes of atoms and ions of transition elements on the periodic table of elements 7.Explain the phenomenon of ionization energy values for transition elements 8.Explain the magnetic properties of transition elements 9.Explain the catalytic properties of transition elements 10.Explaining the stability of the oxidation state of the 3d block transition elements 11.Explain the nature of the reactivity of transition elements 12.Explain the stability properties of transition metal complexes 13.Explain the color phenomenon of transition ions	1.Schematic of the principles of metal extraction from 10 transition elements 2.Write metal extraction reactions from 10 types of transition elements and lecturer presentations 3.Pay attention to the periodic table of the first, second and third series d block elements 4.Write the electronic configuration of the transition elements 5.Discussion about the properties of transition elements in everyday life 6.Pay attention to data on the size of the atoms and ions of the transition elements of the first series on the periodic table of elements 7.Pay attention to and examine the graph data for the ionization energy prices of the first, second and third series transition elements 8.Pay attention to and study magnetic moment data for 3D block ions of transition elements 9.Discussion of several chemical reactions involving transition elements as catalysts 10.Discussion by paying attention to data on oxidation levels of 3d block transition elements 11.Discussion of the reactivity of transition elements by paying attention to the image of the metal dissolution energy cycle in acidic solutions that do not contain ligand complexes 12.Discussion of the stability of complexes of the same transition ions with different charges 13.Pay attention to and examine the	Method, Lectures and discussions, Assignments. 3x50‘			

			data in the color table for several 3D block transition cations **Form of Assessment** : Participatory Activities				
10	Understand the characteristics of the scandium and titanium groups including general properties, oxides and compounds, manufacture, properties and uses	1. Explain the general characteristics of the scandium group 2. Write down the various oxides and compounds of scandium 3. Write down the preparation of scandium compounds 4. Explain the properties of scandium compounds 5. Mention the uses of scandium compounds 6. Explain the general properties of the titanium group 7. Write down the various oxides and compounds of titanium 8. Write about the manufacture of titanium compounds 9. Explain the properties of titanium compounds 10. Mention the uses of titanium compounds	**Criteria:** 1. Discussion of the table of general properties of the scandium group 2. Make a summary of the types of scandium oxides and compounds 3. Make a scheme for making scandium compounds 4. Summarize the properties of scandium compounds 5. Table discussion of general properties of the titanium group 6. Make a summary of the types of titanium oxides and compounds 7. Create a scheme for making titanium compounds 8. Summarize the properties of titanium compounds **Form of Assessment** : Participatory Activities	Case Method, Lectures and discussions, Assignments. 3x50‘			10%

11	1. Understand the characteristics of the vanadium group including general properties, oxides and compounds, manufacture, properties and uses 2. Understand the characteristics of the chromium group including general properties, oxides and compounds, manufacture, properties and uses	1. Explain the general properties of the vanadium group 2. Write down the various oxides and compounds of vanadium 3. Write down the preparation of vanadium compounds 4. Explain the properties of vanadium compounds 5. Mention the uses of vanadium compounds 6. Explain the general properties of the chromium group 7. Write down the various oxides and compounds of chromium 8. Write about the preparation of chromium compounds 9. Explain the properties of chromium compounds 10. Mention the uses of chromium compounds	**Criteria:** 1. Discussion of the table of general properties of the vanadium group 2. Make a summary of the types of vanadium oxides and compounds 3. Create a scheme for making vanadium compounds 4. Summarize the properties of vanadium compounds 5. Table discussion of general properties of the chromium group 6. Make a summary of the types of chromium oxides and compounds 7. Create a scheme for making chromium compounds 8. Summarize the properties of chromium compounds **Form of Assessment** : Participatory Activities, Portfolio Assessment	Case Method, Lectures and discussions, Assignments. 3x50'			10%
12	Understand the characteristics of the manganese group including general properties, oxides and compounds, manufacture, properties and uses	1. Explain the general properties of the manganese group 2. Write down the various oxides and compounds of manganese 3. Write down the preparation of manganese compounds 4. Explain the properties of manganese compounds 5. Mention the uses of manganese compounds	**Criteria:** 1. Discussion of the table of general properties of the manganese group 2. Make a summary of the types of manganese oxides and compounds 3. Create a scheme for making manganese compounds 4. Summarize the properties of manganese compounds **Form of Assessment** : Participatory Activities	Case Method, Lectures and discussions, Assignments. 3x50'			8%

13	Understand the characteristics of the iron group including general properties, oxides and compounds, manufacture, properties and uses	1. Explain the general properties of the iron group 2. Write down the various oxides and compounds of iron 3. Write about the preparation of iron compounds 4. Explain the properties of iron compounds 5. Mention the uses of iron compounds	**Criteria:** 1. Discussion of the table of general properties of the iron group 2. Make a summary of the types of iron oxides and compounds 3. Make a scheme for making iron compounds 4. Summarize the properties of iron compounds **Form of Assessment** : Participatory Activities	Case Method, Lectures and discussions, Assignments. 3x50‘			8%
14	1. Understand the characteristics of the cobalt group including general properties, oxides and compounds, manufacture, properties and uses 2. Understand the characteristics of the nickel group including general properties, oxides and compounds, manufacture, properties and uses	1. Explain the general properties of the cobalt group 2. Write down the various oxides and compounds of cobalt 3. Write about the preparation of cobalt compounds 4. Explain the properties of cobalt compounds 5. Mention the uses of cobalt compounds 6. Explain the general properties of the nickel group 7. Write down the various oxides and compounds of nickel 8. Write about the manufacture of nickel compounds 9. Explain the properties of Nike compounds 10. Mention the uses of nickel compounds	**Criteria:** 1. Discussion of the table of general properties of the cobalt group 2. Make a summary of the types of cobalt oxides and compounds 3. Create a scheme for making cobalt compounds 4. Summarize the properties of cobalt compounds 5. Discussion of the table of general properties of the nickel group 6. Make a summary of the types of nickel oxides and compounds 7. Create a scheme for making nickel compounds 8. Summarize the properties of nickel compounds **Form of Assessment** : Portfolio Assessment	Case Method, Lectures and discussions, Assignments. 3x50'			7%

15	1. Understand the characteristics of the copper group including general properties, oxides and compounds, manufacture, properties and uses 2. Understand the characteristics of the zinc group including general properties, oxides and compounds, manufacture, properties and uses	1. Explain the general properties of the copper group 2. Write down the various oxides and compounds of copper 3. Write down the preparation of copper compounds 4. Explain the properties of copper compounds 5. Mention the uses of copper compounds 6. Explain the general properties of the zinc group 7. Write down the various types of zinc oxides and compounds 8. Write about the preparation of zinc compounds 9. Explain the properties of zinc compounds 10. Mention the uses of zinc compounds	**Criteria:** 1. Discussion of the table of general properties of the copper group 2. Make a summary of the types of copper oxides and compounds 3. Make a scheme for making copper compounds 4. Summarize the properties of copper compounds 5. Discussion of the table of general properties of the zinc group 6. Make a summary of the types of zinc oxides and compounds 7. Make a scheme for making zinc compounds 8. Summarize the properties of zinc compounds **Form of Assessment** : Participatory Activities	Case Method, Lectures and discussions, Assignments. 3x50'			7%
16	Final exams	According to indicators at meeting 9-15	**Criteria:** The Final Semester Examination (UAS) is carried out assessing all relevant indicators through a written examination, with a weight of (3))	Written test 3x50'			0%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	78%
2.	Portfolio Assessment	22%
		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.