



INSTITUT TEKNOLOGI SEPULUH NOPEMBER (ITS)

**FAKULTAS SAINS DAN ANALITIKA DATA
FACULTY OF SCIENCE AND DATA ANALYTICS
DEPARTEMEN KIMIA
DEPARTMENT OF CHEMISTRY**

Kode Dokumen

RENCANA PEMBELAJARAN SEMESTER

MATA KULIAH (MK) COURSE		KODE CODE	Rumpun MK COURSE GROUP	BOBOT (sks) CREDITS		SEMESTER SEMESTER	Tgl Penyusunan Compilation Date
KIMIA CHEMISTRY		SK234102	Umum General	3	0	I/II	22 Juli 2023 22 July 2023
OTORISASI / PENGESAHAN AUTHORIZATION / LEGALIZATION		Dosen Pengembang RPS TLP Development Lecturer		Koordinator RMK Course Group Coordination		KaSubdit SKPB Head of Sub-Directorate of Common Lectures Coordination	
		Zjahra Vianita Nugraheni, M.Si. Dr. Hendro Juwono, M.Si. Arif Fadlan, M.Si., D.Sc. Hamdan Dwi Rizqi, M.Si. Dr. Triyanda Gunawan		Zjahra Vianita Nugraheni, M.Si.		Dr. Didik Khusnul Arif, M.Si.	
Capaian Pembelajaran Learning Outcomes (LO)	CPL-PRODI yang dibebankan pada MK PLO Charged to The Course (ITS)						
	CPL 2	Mampu mengkaji dan memanfaatkan ilmu pengetahuan dan teknologi dalam rangka mengaplikasikannya pada pengetahuan kimia, serta mampu mengambil keputusan secara tepat dari hasil kerja sendiri maupun kerja kelompok dalam bentuk laporan tugas akhir atau bentuk kegiatan pembelajaran lain yang luarannya setara dengan tugas akhir melalui pemikiran logis, kritis, sistematis dan inovatif.					
	PLO 2	Able to study and utilize science and technology in order to apply it to chemical knowledge and be able to make appropriate decisions from the results of their own work or group work in the form of final project reports or other forms of learning activities whose outcomes are equivalent to final assignments through logical, critical thinking, systematic and innovative.					
	CPL-PRODI yang dibebankan pada MK PLO Charged to The Course (Department)						
Capaian Pembelajaran Mata Kuliah (CPMK)							

	Course Learning Outcomes (CLO)								
	CPMK 1 CLO 1	Mahasiswa mampu menggunakan prinsip-prinsip dasar ilmu kimia sebagai dasar dalam mempelajari ilmu yang berkaitan dengan kimia <i>The students should be able to use the principles of basic chemistry knowledge as a basis to learn chemistry in which they will learn further throughout their whole studies.</i>							
	CPMK 2 CLO 2	Mahasiswa dapat melakukan perhitungan-perhitungan dasar kimia <i>The students should be able to do the basic chemistry calculations.</i>							
	CPMK 3 CLO 3	Mampu mengambil keputusan secara tepat dalam konteks penyelesaian masalah di bidang kimia atau yang terkait, berdasarkan hasil analisis informasi dan data <i>The students should be able to make appropriate decisions to solve the problems in chemistry or related fields, based on the results of information and data analysis</i>							
	CPMK 4 CLO 4	Mahasiswa mampu menerapkan pola pikir kimia yang logis untuk menyelesaikan permasalahan dalam kehidupan sehari-hari <i>The students should be able to apply a logical mindset to solve problems in daily life</i>							
Peta CPL – CP MK <i>PLO – CLO</i> <i>Mapping</i>		CPL 1 PLO 1	CPL 2 PLO 2	CPL 3 PLO 3	CPL 4 PLO 4	CPL 5 PLO 5	CPL 6 PLO 6	CPL 7 PLO 7	dst. etc.
	CPMK 1 CLO 1		√						
	CPMK 2 CLO 2		√						
	CPMK 3 CLO 3		√						
	CPMK 4 CLO 4		√						
Diskripsi Singkat MK	Sains merupakan pengetahuan secara sistematis yang diperoleh melalui observasi dan eksperimen. Kimia merupakan cabang ilmu sains yang sangat erat kaitannya dengan kehidupan sehari-hari. Mata kuliah Kimia 1 merupakan pengantar yang menyeluruh tentang dasar-dasar kimia. Dalam mata kuliah ini, mahasiswa akan memperoleh pemahaman tentang struktur atom, sifat materi, dan reaksi kimia. Materi perkuliahan ini dirancang untuk membekali mahasiswa dengan pengetahuan dasar yang diperlukan untuk memahami berbagai fenomena kimia dalam kehidupan sehari-hari maupun aplikasi dalam bidang ilmu lainnya, termasuk rekayasa atau teknik. Mata kuliah ini akan memberikan pondasi yang kuat bagi mahasiswa dalam								

Brief Course Description	memahami konsep-konsep lanjutan pada tingkat lebih tinggi dalam bidang kimia dan disiplin ilmu lainnya. Dengan menyelesaikan mata kuliah ini, mahasiswa diharapkan dapat mengembangkan keterampilan analitis, kritis, dan <i>problem-solving</i> yang penting dalam studi ilmiah. <i>Science is systemized knowledge which is obtained through observations and experiments. Chemistry is a branch of science that belongs to every aspect of life. Chemistry 1 course is a comprehensive introduction to the basics of chemistry. In this course, students will learn about atomic structure, material properties, and chemical reactions. This learning material is designed to equip students with the basic knowledge needed to understand various chemical phenomena in everyday life and applications in other fields of study. This course will provide a strong basic for students to understand advanced concepts at a higher level in chemistry and other disciplines, including engineering field. By completing this course, students are expected to be able to develop analytical, critical, and problem-solving skills that are important in scientific studies.</i>	
Bahan Kajian: Materi pembelajaran Study Material: Subject Matter	Konsep Dasar Kimia, Model dan Struktur Atom, Konfigurasi Elektron dan Ikatan Kimia, Stoikiometri dan Reaksi Kimia, Wujud Zat dan Perubahan Fasa, Kestimbangan Kimia, Teori Asam Basa, Kestimbangan Ionik dalam Larutan (Asam Basa, Kelarutan, Kompleks dan Pengendapan), Termodinamika Kimia, Kinetika Kimia dan Elektrokimia. <i>The Basic Concepts of Chemistry, Atom Structures and Models, Electron Configurations and Chemical Bonds, Stoichiometric and Chemical Reactions, Chemical Solutions, Concentrations and, Colligative Chemical Properties, Chemistry Equilibrium, The States of Matters and Phase Transformations, Acid-Base Theory, Ionic Equilibrium in Substances (Acid-Base, Solubility, Complex and Precipitation), Chemistry Thermodynamics, Chemical Kinetics, Electrochemistry.</i>	
Pustaka References	Utama: <i>Primary:</i>	
	1. Tim Dosen Departemen Kimia, 2023. Kimia 1, Edisi ke-3, Media Bersaudara, Surabaya. (Untuk kelas Bahasa) 2. Tim Dosen Departemen Kimia, 2023. Chemistry, 1st edition, Media Bersaudara, Surabaya. (For IUP class)	
	Pendukung: <i>Supporting:</i>	1. Oxtoby, D.W., Gillis, H.P. and Campion, A., 2012. <i>Principles of Modern Chemistry</i>, Edisi ketujuh, Brooks/Cole. - Oxtoby, D.W., Gillis, H.P. and Campion, A., 2012. <i>Principles of Modern Chemistry</i>, 7th edition, Brooks/Cole. 2. Chang, R. and Goldsby, K., 2012. <i>Chemistry</i>, Edisi kesebelas, McGraw-Hill, USA. - Chang, R. and Goldsby, K., 2012. <i>Chemistry</i>, 11th edition, McGraw-Hill, USA. 3. Goldberg, D. E., 2007. <i>Fundamental of Chemistry</i>, Edisi keempat, McGraw-Hill Companies. - Goldberg, D. E., 2007. <i>Fundamental of Chemistry</i>, 4th edition, McGraw-Hill Companies
Dosen Pengampu <i>Lecturer</i>	Tim dosen Kimia 1 <i>Chemistry 1 Team</i>	
Matakuliah syarat	Tidak ada prasyarat	

Pre-Requisite Courses		No pre-requisite courses					
Mg Ke-Week	Kemampuan akhir tiap tahapan belajar (Sub-CPMK) Sub-Course Learning Outcome	Penilaian Assessment		Bentuk Pembelajaran; Learning Design Metode Pembelajaran; Learning Method Penugasan Mahasiswa; Student Assignment [Estimasi Waktu] [Estimated Time]		Materi Pembelajaran Learning Material [Pustaka] [Reference]	Bobot Penilaian (%) Assessment Composition (%)
		Indikator Indicator	Kriteria & Teknik Criteria and Technique				
(1)	(2)	(3)	(4)	Tatap Muka (5)	Daring (6)	(7)	(8)
(1)	(2)	(3)	(4)	Face-to-face Class (5)	Online Class (6)	(7)	(8)
1	Mahasiswa mampu menjelaskan prinsip-prinsip dasar kimia, meliputi Konsep Dasar Kimia <i>The students should be able to explain the fundamental principles of chemistry, including the basic concepts of chemistry</i>	- Ketepatan dalam membedakan zat/materi, unsur senyawa, larutan dan campuran serta sifat fisik dan kimianya <i>Accuracy in distinguishing substances/materials, compound elements, solutions and mixtures as well as their physical and chemical properties</i> - Ketepatan dalam menjelaskan hukum-hukum dasar penggabungan unsur	Kriteria: Rubrik penilaian Teknik/Technique: <i>Team base project</i> (non-test)	Kuliah Tatap Muka <i>Face-to-face Class</i> Diskusi <i>Discussion</i> [TM: 1x(2x50')] [TM: 1x(1x50')] [BM: 1x(3x60')] [PT: 1x(3x60')] [OM: 1x(2x50')] [OM: 1x(1x50')] [SL: 1x(3x60')] [SA: 1x(3x60')]		- Kontrak Kuliah - Proses analisis materi (unsur, senyawa, sifat fisika, sifat kimia) - Hukum-hukum dasar penggabungan unsur (Proust, Lavoisier, Dalton) - Course agreement - Material analysis process (elements, compounds, physical properties, chemical properties) Laws of chemical combinatio	3

		unsur (Proust, Lavoisier, Dalton) <i>Accuracy in explaining the basic laws of chemical combination (Proust, Lavoisier, Dalton)</i>				<i>n (Proust, Lavoisier, Dalton)</i>	
2	Mahasiswa mampu menjelaskan prinsip-prinsip dasar kimia, meliputi Model dan Struktur Atom <i>The students should be able to explain the fundamental principles of chemistry including atom structures and models.</i>	- Ketepatan dalam menjelaskan model dan struktur atom <i>Accuracy in explaining concept of model and atomic structures</i> - Ketepatan dalam menjelaskan percobaan-percobaan yang mendasari model dan struktur atom (Dalton, Thompson, Rutherford, Bohr dan Spektrum Atom Hidrogen) <i>Accuracy in explaining The underlying experiments of model and atomic structure (Dalton, Thompson, Rutherford, Bohr and</i>	Kriteria: Rubrik penilaian Teknik/Technique: Team base project (non-test)	Kuliah Tatap Muka <i>Face-to-face Class</i> Diskusi <i>Discussion</i> [TM: 1x(2x50')] [TM: 1x(1x50')] [BM: 1x(3x60')] [PT: 1x(3x60')] [OM: 1x(2x50')] [OM: 1x(1x50')] [SL: 1x(3x60')] [SA: 1x(3x60')]		- Perkembangan model dan struktur atom - Percobaan-percobaan yang mendasarinya (Dalton, Thompson, Rutherford, Bohr dan Spektrum Atom Hidrogen) <i>The development of atom structures and model</i> <i>The underlying experiments (Dalton, Thompson, Rutherford, Bohr and The Atomic Spectrum of Hydrogen)</i>	3

		<i>The Atomic Spectrum of Hydrogen)</i> • Ketepatan dalam perhitungan yang terkait dengan model dan struktur atom • <i>Accuracy in calculation related to model and atomic structure</i>					
3	Mahasiswa mampu menjelaskan prinsip-prinsip dasar kimia, meliputi Konfigurasi Elektron <i>The students should be able to explain the fundamental principles of chemistry, including electron configurations</i>	• Ketepatan dalam menuliskan konfigurasi elektron dari unsur/atom dan ion <i>Accuracy in writing the electron configuration of elements/atoms and ions</i> • Ketepatan dalam menentukan letak unsur/atom dalam suatu sistem periodik berdasarkan konfigurasi elektronnya <i>Accuracy in determining the position of</i>	Kriteria: Rubrik penilaian Teknik/Technique: <i>Team base project</i> (non-test)	Kuliah Tatap Muka <i>Face-to-face Class</i> Diskusi <i>Discussion</i> [TM: 1x(2x50')] [TM: 1x(1x50')] [BM: 1x(3x60')] [PT: 1x(3x60')] [OM: 1x(2x50')] [OM: 1x(1x50')] [SL: 1x(3x60')] [SA: 1x(3x60')]		• Konfigurasi elektron suatu unsur dan ion • Sistem Periodik Unsur • Sifat periodisitas unsur • <i>Electron configurations of elements and ions</i> • <i>Periodic system of elements</i> • <i>The periodicity of elements</i>	4

		<i>elements/atoms in a periodic table based on their electron configurations</i> • Ketepatan dalam menjelaskan sifat periodisitas unsur (jari-jari atom, energi ionisasi, afinitas elektron, elektronegatifitas) <i>Accuracy in explaining the periodicity of elements (atomic radius, ionization energy, electron affinity, electronegativity)</i> •					
4	Mahasiswa mampu menjelaskan prinsip-prinsip dasar kimia, meliputi Konsep Mol, Stoikiometri dan Sifat Koligatif Larutan <i>The students should be able to explain the fundamental</i>	• Ketepatan penggunaan konsep mol dalam perhitungan terkait dengan reaksi kimia <i>Accuracy in using the mole concept in</i>	Kriteria: Marking scheme Teknik/Technique: Kuis/Quiz (Test)	Kuliah Tatap Muka <i>Face-to-face Class</i> Diskusi <i>Discussion</i>		• Perhitungan konsep mol • Rumus empiris dan rumus molekul • Satuan Konsentrasi (M, N, %, m, F, ppm, ppb)	4

	<i>principles of chemistry, including chemical solutions, concentrations, and colligative properties</i>	<i>calculations related to chemical reactions</i> • Ketepatan dalam menentukan rumus empiris dan rumus molekul <i>Accuracy in determining the empirical formula and molecular formula</i> • Ketepatan dalam menghitung konsentrasi larutan <i>Accuracy in determining the concentration of solution</i> • Ketepatan dalam menggunakan prinsip stoikiometri dalam reaksi kimia <i>Accuracy in using stoichiometric principles in chemical reactions</i> • Ketepatan dalam perhitungan standarisasi larutan	<i>Team base project (non-test)</i>	[TM: 1×(2×50')] [TM: 1×(1×50')] [BM: 1×(3×60')] [PT: 1×(3×60')] [OM: 1×(2×50')] [OM: 1×(1×50')] [SL: 1×(3×60')] [SA: 1×(3×60')]		• Stoikiometri dalam Larutan • Standarisasi • Sifat koligatif larutan • <i>Mole concept's calculation</i> • <i>Empirical and molecular formula</i> • <i>Concentration units (M, N, %, m, F, ppm, ppb)</i> • <i>Stoichiometry in solution</i> • <i>Standardization</i> • <i>Redox concept</i> • <i>Colligative properties</i> •	
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		<i>Accuracy in the calculation of solution standarization</i> • Ketepatan dalam menerapkan konsep redoks dalam suatu reaksi kimia <i>Accuracy in applying the redox concept in a chemical reaction</i> • Ketepatan dalam menjelaskan sifat koligatif larutan <i>Accuracy in explaining colligative properties of solutions</i> • Ketepatan dalam melakukan perhitungan terkait dengan sifat koligatif larutan (penurunan tekanan uap, kenaikan titik didih, penurunan titik beku, dan tekanan osmotik)					
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		<i>Accuracy in performing calculations related to colligative properties of solutions (decreasing vapor pressure, boiling point elevation, freezing point depression, and osmotic pressure)</i>					
5	Mahasiswa mampu menjelaskan prinsip-prinsip dasar kimia, meliputi Ikatan Kimia <i>The students should be able to explain the fundamental principles of chemistry, including chemical bonds</i>	- Ketepatan dalam menjelaskan konsep pembentukan ikatan ionik, ikatan kovalen dan ikatan kovalen polar, momen dipol, ikatan logam, ikatan hidrogen, dan ikatan Van der Walls <i>Accuracy in explaining the concepts of ionic bond formation, covalent bonds and polar covalent bonds, dipole moments, metallic bonds, hydrogen bonds, and Van der Walls bonds</i> - Ketepatan dalam menentukan struktur	Kriteria: Rubrik penilaian Teknik/Technique: <i>Team base project</i> (non-tes)	Kuliah Tatap Muka <i>Face-to-face Class</i> Diskusi <i>Discussion</i> [TM: 1x(2x50')] [TM: 1x(1x50')] [BM: 1x(3x60')] [PT: 1x(3x60')] [OM: 1x(2x50')] [OM: 1x(1x50')] [SL: 1x(3x60')] [SA: 1x(3x60')]		- Ikatan ionik, kovalen dan kovalen polar, momen dipol, ikatan logam, ikatan hidrogen, dan ikatan Van der Walls - Struktur dan bentuk geometri molekul (struktur Lewis dan hibridisasi) <i>Ionic bond, Polar covalent and covalent bonds, dipole moment, metal bonds, hydrogen bonds, and Van der Walls bonds</i>	4

		dan bentuk geometri molekul (struktur Lewis dan hibridisasi) <i>Accuracy in determining the structure and geometry of the molecule (Lewis structure and hybridization)</i> • Ketepatan dalam melakukan perhitungan terkait dengan ikatan (muatan formal, orde ikatan, bilangan sterik, perbedaan momen dipol, momen magnet) <i>Accuracy in performing calculations related to chemical bonding (formal charge, bond order, steric number, difference in dipole moment, magnetic moment)</i>				• <i>Molecular structures and geometrics (Lewis structures and hybridization)</i>	
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6	Mahasiswa mampu menjelaskan prinsip-prinsip dasar kimia meliputi Wujud Zat dan Perubahan Fasa <i>The students should be able to explain the fundamental principles of chemistry, including the state of matters and phase transformations</i>	• Ketepatan dalam menjelaskan hukum-hukum gas dan sifat fisiknya • Ketepatan dalam melakukan perhitungan terkait dengan hukum-hukum gas (gas ideal dan non-ideal) • Ketepatan dalam menjelaskan konsep pada zat cair dan sifat fisiknya (tekanan uap, titik didih, tegangan permukaan, viskositas)	Kriteria: Rubrik penilaian Teknik/Technique: <i>Team base project</i> (non-tes)	Kuliah Tatap Muka <i>Face-to-face Class</i> Diskusi <i>Discussion</i> [TM: 1x(2x50')] [TM: 1x(1x50')] [BM: 1x(3x60')] [PT: 1x(3x60')] [OM: 1x(2x50')] [OM: 1x(1x50')] [SL: 1x(3x60')] [SA: 1x(3x60')]		• Wujud Gas (Hukum-hukum gas dan sifat fisiknya) • Wujud Cair (sifat fisik cairan: tekanan uap, titik didih, tegangan permukaan, viskositas) • <i>Gaseous state (Gas laws and its physical properties)</i> • <i>Liquid state(Liquid physical properties: vapor pressure, boiling point, surface tension, viscosity)</i> •	3
7	Mahasiswa mampu menjelaskan prinsip-prinsip dasar kimia meliputi Wujud Zat dan Perubahan Fasa <i>The students should be able to explain the fundamental principles of chemistry, including the state of matters and phase transformations.</i>	• Ketepatan dalam menjelaskan konsep wujud zat padat <i>Accuracy in explaining the concept of solid state</i>	Kriteria: Rubrik penilaian Teknik/Technique: <i>Tugas/Assignment</i> (non-test)	Kuliah Tatap Muka <i>Face-to-face Class</i> Diskusi <i>Discussion</i> [TM: 1x(2x50')]		• Wujud Padat (kisi Kristal, kubus sederhana, kubus berpusat muka, kubus berpusat badan body centered cube, indeks Miller, persamaan Bragg) • Diagram fasa	4

		• Ketepatan dalam menentukan struktur dari zat padat (kisi Kristal, kubus sederhana, kubus berpusat muka, kubus berpusat badan) <i>Accuracy in determining the structure of solid state (crystal lattice, simple cubic, face-centered cubic, body-centered cubic)</i> • Ketepatan dalam menggambarkan bidang kristal sesuai indeks Miller <i>Accuracy in determining the crystal lattice according to the Miller index</i> • Ketepatan dalam menjelaskan konsep penentuan bidang	<i>Team base project (non-test)</i> <i>Topic 4: Chemical equilibrium and buffer</i>	[TM: 1×(1×50')] [BM: 1×(3×60')] [PT: 1×(3×60')] [OM: 1×(2×50')] [OM: 1×(1×50')] [SL: 1×(3×60')] [SA: 1×(3×60')]		• Solid-state (Crystal lattice, simple cube, face- centered cube, body-centered cube, Miller index, Bragg's equation) • Phase diagram	
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		kristal berdasarkan persamaan Bragg <i>Accuracy in explaining the concept of determining the crystal lattice based on the Bragg equation</i> • Ketepatan dalam menjelaskan konsep perubahan wujud zat berdasarkan diagram fasa <i>Accuracy in explaining the concept of changes in state of matter according to phase diagrams</i>					
8	Evaluasi Tengah Semester / Mid-Semester Examination						25
9	Mahasiswa mampu menjelaskan prinsip-prinsip dan melakukan perhitungan dasar ilmu kimia, meliputi Keseimbangan Ionik dalam Larutan	• Ketepatan dalam menjelaskan konsep asam-basa menurut teori Arrhenius, Brønsted-Lowry, dan Lewis	Kriteria: Rubrik penilaian Teknik/Technique: <i>Team base project (non-test)</i>	Kuliah Tatap Muka <i>Face-to-face Class</i> Diskusi <i>Discussion</i>		• Teori Asam Basa (Teori Arrhenius, Brønsted-Lowry, Teori Lewis) • Kekuatan Asam Basa • Keseimbangan asam-basa lemah	4

	<i>The students should be able to explain the fundamental principles of chemistry, including ionic equilibrium in substances</i>	<i>Accuracy in explaining acid-base concepts according to the theory of Arrhenius, Brønsted-Lowry, and Lewis</i> • Ketepatan dalam menentukan kekuatan asam-basa <i>Accuracy in determining the strength of the acid-base</i> • Ketepatan menerapkan konsep kesetimbangan asam-basa lemah <i>Accuracy in applying the concept of equilibrium in weak acid-base</i> • Ketepatan dalam menentukan derajat ionisasi dan tetapan ionisasi <i>Accuracy in determining the degree of ionization and ionization constant</i>		[TM: 1×(2×50')] [TM: 1×(1×50')] [BM: 1×(3×60')] [PT: 1×(3×60')] [OM: 1×(2×50')] [OM: 1×(1×50')] [SL: 1×(3×60')] [SA: 1×(3×60')]		• Derajat ionisasi dan tetapan ionisasi • Acid-base theory (Arrhenius, Bronsted- Lowry theory, Lewis theory) • Degree of ionization and ionization constant • Acid-base strength • Weak acid-base equilibrium	
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		• Ketepatan dalam menentukan derajat keasaman (pH) dari larutan asam dan basa <i>Accuracy in determining the degree of acidity (pH) of acidic and basic solutions</i> •					
10	Mahasiswa mampu menjelaskan prinsip-prinsip dan melakukan perhitungan dasar ilmu kimia, meliputi Kestimbangan Ionik dalam Larutan <i>The students should be able to explain the fundamental principles of chemistry, including ionic equilibrium substances</i>	• Ketepatan menerapkan konsep kesetimbangan ionik antara zat padat dan larutan <i>The accuracy of applying the concept of ionic equilibrium between solids and solutions</i> • Ketepatan dalam menerapkan konsep buffer dalam larutan dan perubahannya <i>Accuracy in applying the concept of buffer in solution and its changes</i>	Kriteria: Rubrik penilaian Teknik/Technique: <i>Team base project</i> (non-test)	Kuliah Tatap Muka <i>Face-to-face Class</i> Diskusi <i>Discussion</i> [TM: 1x(2x50')] [TM: 1x(1x50')] [BM: 1x(3x60')] [PT: 1x(3x60')] [OM: 1x(2x50')] [OM: 1x(1x50')] [SL: 1x(3x60')] [SA: 1x(3x60')]	Channel youtube departemen kimia	• Kestimbangan ionik antara zat padat dan larutan • Sistem Buffer • Kelarutan • <i>Ionic equilibrium between solid and liquid</i> • <i>Buffer system</i> • <i>Solubility</i> •	4

		• Ketepatan dalam menerapkan konsep kelarutan dalam pembuatan larutan <i>Accuracy in applying the concept of solubility in making solutions</i> • Ketepatan dalam melakukan perhitungan terkait kesetimbangan larutan (konsentrasi, pH, dan lain-lain) • <i>Accuracy in performing calculations related to solution equilibrium (concentration, pH, etc.)</i>					
11	Mahasiswa mampu menjelaskan prinsip-prinsip dan melakukan perhitungan dasar ilmu kimia meliputi, Termodinamika Kimia dan Termokimia <i>The students should be able to explain the fundamental principles of chemistry including chemical</i>	• Ketepatan dalam menjelaskan konsep termodinamika dasar <i>Accuracy in explaining basic thermodynamic concepts</i> • Ketepatan dalam menjelaskan konsep dalam hukum termodinamika ke-1	Kriteria: Rubrik penilaian Teknik/Technique: <i>Team base project (non-test)</i>	Kuliah Tatap Muka <i>Face-to-face Class</i> Diskusi <i>Discussion</i> [TM: 1x(2x50')] [TM: 1x(1x50')] [BM: 1x(3x60')]		• Konsep termodinamika (prinsip, keadaan dan proses) • Hukum I Termodinamika: energi dalam, kerja dan kalor • Kapasitas panas, kalorimetri dan entalpi	4

	<i>thermodynamics and thermochemistry</i>	<i>Accuracy in explaining concepts in the first law of thermodynamics</i> • Ketepatan dalam menjelaskan konsep dalam hukum termodinamika ke-2 <i>Accuracy in explaining concepts in the second law of thermodynamics</i> • Ketepatan dalam menjelaskan konsep dalam hukum termodinamika ke-3 <i>Accuracy in explaining concepts in the third law of thermodynamics</i> • Ketepatan dalam menerapkan prinsip Termokimia serta penggunaannya untuk menjelaskan kespontanan reaksi kimia		[PT: 1×(3×60')] [OM: 1×(2×50')] [OM: 1×(1×50')] [SL: 1×(3×60')] [SA: 1×(3×60')]		• Hukum II Termodinamika dan spontanitas • Termokimia serta penggunaannya untuk menjelaskan kespontanan reaksi kimia • Perhitungan yang berkaitan dengan aplikasi mesin Carnot • <i>Thermodynamic concepts (principles, states, and processes)</i> • <i>First Law of Thermodynamics: internal energy, work, and heat</i> • <i>Heat capacity, calorimetry, and enthalpy</i> • <i>The second law of thermodynamics and spontaneity</i> • <i>Thermochemistry and its use to explain the spontaneity of</i>	
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		<i>Accuracy in applying the principles of thermochemistry and its use to explain the spontaneity of chemical reaction</i> • Ketepatan dalam melakukan perhitungan terkait dengan penerapan hukum termodinamika (menentukan kalor, energi bebas Gibbs, entalpi, entropi, aplikasi mesin Carnot, dan lain-lain) • <i>Accuracy in performing calculations related to the application of thermodynamic laws (determining heat, Gibbs free energy, enthalpy, entropy, Carnot engine applications, etc.)</i>				<i>chemical reactions</i> • <i>Calculations related to the Application of Carnot engine</i> •	
12	Mahasiswa mampu menjelaskan prinsip-prinsip	• Ketepatan dalam menerapkan konsep	Kriteria: Rubrik penilaian	Kuliah Tatap Muka		• Konsep Keseimbangan	4

	dan melakukan perhitungan dasar ilmu kimia, meliputi Keseimbangan Kimia <i>The students should be able to explain the fundamental principles of chemistry, including chemical equilibrium</i>	Keseimbangan Kimia dan Tetapan Keseimbangan (Quotient reaksi, tetapan keseimbangan Kp dan Kc) <i>Accuracy in applying the concept of Chemical Equilibrium and Equilibrium Constants (Reaction Quotient, Kp and Kc equilibrium constants)</i> • Ketepatan dalam menerapkan Asas Le Chatelier dalam keseimbangan Kimia <i>Accuracy in applying Le Chatelier's Principle in Chemical equilibrium</i> • Ketepatan dalam menyebutkan dan menjelaskan faktor-faktor yang mempengaruhi keseimbangan kimia Accuracy in	Teknik/Technique: <i>Team base project (non-test)</i>	<i>Face-to-face Class</i> Diskusi <i>Discussion</i> <i>[TM: 1x(2x50')]</i> <i>[TM: 1x(1x50')]</i> <i>[BM: 1x(3x60')]</i> <i>[PT: 1x(3x60')]</i> <i>[OM: 1x(2x50')]</i> <i>[OM: 1x(1x50')]</i> <i>[SL: 1x(3x60')]</i> <i>[SA: 1x(3x60')]</i>		Kimia dan Tetapan Keseimbangan (Quotient reaksi, tetapan keseimbangan Kp dan Kc) • Asas Le Chatelier • Faktor-faktor yang mempengaruhi keseimbangan kimia • <i>Concept of chemical equilibrium and equilibrium constant (Reaction Quotient, the equilibrium constant, Kp and Kc)</i> • <i>Le Chatelier's principles</i> • <i>Factors that affect chemical equilibrium</i>	
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		mentioning and explaining the factors that affect chemical equilibrium • Ketepatan dalam melakukan perhitungan terkait kesetimbangan kimia (konsentrasi, Quotient reaksi, tetapan kesetimbangan Kp dan Kc, dan lain-lain) • <i>Accuracy in performing calculations related to chemical equilibrium (concentration, reaction Quotient, Kp and Kc equilibrium constants, etc.)</i>					
13	Mahasiswa mampu menjelaskan prinsip-prinsip dan melakukan perhitungan dasar ilmu kimia, meliputi Kinetika Kimia <i>The students should be able to explain the fundamental principles of chemistry, including chemical kinetics</i>	• Ketepatan dalam menerapkan konsep kinetika kimia <i>Accuracy in applying chemical kinetics concepts</i> • Ketepatan dalam menentukan nilai orde reaksi, konstanta laju, dan persamaan laju	Kriteria: Rubrik penilaian Teknik/Technique: <i>Team base project (non-test)</i>	Kuliah Tatap Muka <i>Face-to-face Class</i> Diskusi <i>Discussion</i> [TM: 1x(2x50')] [TM: 1x(1x50')] [BM: 1x(3x60')]		• Konsep kinetika kimia • Laju dalam reaksi kimia • Penentuan laju reaksi, orde dan konstanta laju reaksi • Pengaruh suhu pada laju reaksi • Reaksi elementer	4

		reaksi dalam suatu reaksi kimia <i>Accuracy in determining the value of the reaction order, rate constant, and reaction rate equation in a chemical reaction</i> • Ketepatan menyebutkan dan menjelaskan faktor-faktor yang mempengaruhi laju reaksi (konsentrasi, katalis, suhu) <i>Accurately mentioning and explaining the factors that affect the reaction rate (concentration, catalyst, temperature)</i> • Ketepatan dalam menjelaskan konsep reaksi elementer <i>Accuracy in explaining the concept of elementary reactions</i>		[PT: 1×(3×60')] [OM: 1×(2×50')] [OM: 1×(1×50')] [SL: 1×(3×60')] [SA: 1×(3×60')]		• Katalis • <i>The concept of chemical kinetics</i> • <i>Rate of chemical reactions</i> • <i>Determination of reaction rates, orders, and rate constants</i> • <i>Effect of temperature on reaction rates</i> •	
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14	Mahasiswa mampu menjelaskan prinsip-prinsip dan melakukan perhitungan dasar ilmu kimia, meliputi Elektrokimia <i>The students should be able to explain the fundamental principles of chemistry, including electrochemistry</i>	- Ketepatan dalam menerapkan konsep reaksi redoksi dalam sel elektrokimia (elektroda dan larutan elektrolit) <i>Accuracy in applying the concept of redox reactions in electrochemical cells (electrodes and electrolyte solutions)</i> - Ketepatan menjelaskan pengaruh konsentrasi dalam sel elektrokimia dan persamaan Nerst <i>Accuracy in explaining the effect of concentration in electrochemical cells and the Nernst equation</i> - Ketepatan dalam menerapkan konsep elektrokimia untuk aplikasi sel volta	Kriteria: Marking scheme Teknik/Technique: Kuis/Quiz (test)	Kuliah Tatap Muka <i>Face-to-face Class</i> Diskusi <i>Discussion</i> [TM: 1x(2x50')] [TM: 1x(1x50')] [BM: 1x(3x60')] [PT: 1x(3x60')] [OM: 1x(2x50')] [OM: 1x(1x50')] [SL: 1x(3x60')] [SA: 1x(3x60')]		- Sel elektrokimia (elektroda dan larutan elektrolit dalam sel elektrokimia) - Pengaruh konsentrasi dan persamaan Nerst - Penggunaan konsep elektrokimia untuk aplikasi sel volta (baterai dan Fuel Cells) serta elektrolisis - Korosi dan pencegahan korosi <i>The concept of the redox reaction</i> <i>Electrochemical cells (electrodes and electrolyte solutions in electrochemical cells)</i> <i>Effect of concentration and Nernst equation</i>	5

		(baterai dan Fuel Cells) serta elektrolisis <i>Accuracy in applying electrochemical concepts to voltaic cell applications (batteries and fuel cells) and electrolysis</i> • Ketepatan menjelaskan proses korosi dan pencegahannya berdasarkan prinsip elektrokimia <i>Accurately explaining the corrosion process and its prevention based on electrochemical principles</i> • Ketepatan dalam melakukan perhitungan terkait dengan sel elektrokimia (konsentrasi, potensial sel standar, potensial sel, energi bebas Gibbs, massa logam yang terdeposit, dan lain-lain)				• <i>Use of electrochemical concepts for voltaic cell applications (batteries and Fuel Cells) and electrolysis</i> • <i>Corrosion and corrosion prevention</i>	
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		• <i>Accuracy in performing calculations related to electrochemical cells (concentration, standard cell potential, cell potential, Gibbs free energy, mass of metal deposited, etc.)</i>					
15-16	Evaluasi Akhir Semester/ <i>Final Semester Examination</i>						25

Catatan:

1. **Capaian Pembelajaran Lulusan PRODI (CPL-PRODI)** adalah kemampuan yang dimiliki oleh setiap lulusan PRODI yang merupakan internalisasi dari sikap, penguasaan pengetahuan dan ketrampilan sesuai dengan jenjang prodinya yang diperoleh melalui proses pembelajaran.
2. **CPL yang dibebankan pada mata kuliah** adalah beberapa capaian pembelajaran lulusan program studi (CPL-PRODI) yang digunakan untuk pembentukan/pengembangan sebuah mata kuliah yang terdiri dari aspek sikap, ketrampilan umum, ketrampilan khusus dan pengetahuan.
3. **CP Mata kuliah (CPMK)** adalah kemampuan yang dijabarkan secara spesifik dari CPL yang dibebankan pada mata kuliah, dan bersifat spesifik terhadap bahan kajian atau materi pembelajaran mata kuliah tersebut.
4. **Sub-CP Mata kuliah (Sub-CPMK)** adalah kemampuan yang dijabarkan secara spesifik dari CPMK yang dapat diukur atau diamati dan merupakan kemampuan akhir yang direncanakan pada tiap tahap pembelajaran, dan bersifat spesifik terhadap materi pembelajaran mata kuliah tersebut.
5. **Indikator penilaian** kemampuan dalam proses maupun hasil belajar mahasiswa adalah pernyataan spesifik dan terukur yang mengidentifikasi kemampuan atau kinerja hasil belajar mahasiswa yang disertai bukti-bukti.
6. **Kriteria Penilaian** adalah patokan yang digunakan sebagai ukuran atau tolok ukur ketercapaian pembelajaran dalam penilaian berdasarkan indikator-indikator yang telah ditetapkan. Kreteria penilaian merupakan pedoman bagi penilai agar penilaian konsisten dan tidak bias. Kreteria dapat berupa kuantitatif ataupun kualitatif.
7. **Bentuk penilaian:** tes dan non-tes.
8. **Bentuk pembelajaran:** Kuliah, Responsi, Tutorial, Seminar atau yang setara, Praktikum, Praktik Studio, Praktik Bengkel, Praktik Lapangan, Penelitian, Pengabdian Kepada Masyarakat dan/atau bentuk pembelajaran lain yang setara.

9. **Metode Pembelajaran:** Small Group Discussion, Role-Play and Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, dan metode lainnya yang setara.
10. **Materi Pembelajaran** adalah rincian atau uraian dari bahan kajian yg dapat disajikan dalam bentuk beberapa pokok dan sub-pokok bahasan.
11. **Bobot penilaian** adalah prosentasi penilaian terhadap setiap pencapaian sub-CPMK yang besarnya proposional dengan tingkat kesulitan pencapaian sub-CPMK tsb., dan totalnya 100%.
12. **TM**=Tatap Muka, **PT**=Penugasan terstruktur, **BM**=Belajar mandiri

Note:

1. **Learning Outcomes of Study Program (LO)** is the ability possessed by every graduate of the study program which is the internalization of attitudes, mastery of knowledge and skills in accordance with the level of study program obtained through the learning proces.
2. **PLO Charged to The Course** is some of the learning outcomes of study program graduates (PLO) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
3. **Course Learning Outcome (CLO)** is the ability that is described specifically from the PLO that is charged to the course and is specific to the study material or learning material of the course.
4. **Sub-CLO** is the ability that is specifically described from the CLO that can be measured or observed and is the final ability that is planned at each stage of learning and is specific to the learning material of the course.
5. **Indicator** is the ability in the process and student learning outcomes is a specific and measurable statement that identifies the ability or performance of student learning outcomes accompanied by evidence
6. **Criteria** is a benchmark that is used as a measure or benchmark for learning achievement in an assessment based on predetermined indicators. Assessment criteria are guidelines for assessors so that the assessment is consistent and unbiased. Criteria can be either quantitative or qualitative.
7. **Assesment Design:** test and non-test.
8. **Learning Design:** 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 Method:** Small Group Discussion, Role-Play and Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent method.
10. **Learning Material** are details or descriptions of study materials that can be presented in the form of several main points and sub-topics.
11. **Assesment Composition** is the percentage of assessment of each achievement of the sub-CLO which is proportional to the level of difficulty of achieving the sub-CLO, and the total is 100%

OM=Offline Meeting, **SA**=Structured Assesment, **SL**=Self Learning