ONE SEMESTER COURSE PLAN (RPSS)

BASIC CHEMISTRY (KIM 1105 3(2-3))

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SEMESTER LEARNING PLAN (RPS)

Course Name	:	Basic Chemistry /KIM 1105
Code/Credit	:	Even/3(2-3)
Description	:	This course encourages students to study chemistry and material transformation more deeply and comprehensively to be used as a foundation for scientific thinking and the development of science and technology in the fields of agriculture, marine, and tropical biosciences. The theoretical basis presented in this course is in the form of advanced studies from Science & Technology Chemistry (KIM 1104). The study begins with the importance of scientific methods and thinking in chemistry; the study of material starting from the stages of construction, transformation, and its dynamics; and the application of chemical innovations in material transformation in order to improve the quality and welfare of living things.
Prerequisites course	:	Chemistry in Science and Technology (KIM 1104)
Learning Outcomes	:	1. Able to explain the role of chemistry as a foundation for scientific thinking and development of science and technology in agriculture, marine, and tropical biosciences. 2. Able to apply the concept of chemistry in constructing, transforming matter, and studying its dynamics. 3. Able to explain the application of chemical innovations in the transformation of matter. 4. Able to communicate and convey opinions and ideas logically to solve a problem and respect the opinions of others. 5. Able to collaborate and cooperate through group work in the classroom and in the laboratory by paying attention to aspects of safety, occupational health, and the environment.
Division/Field	:	DPKU/Chemistry
Lecturer	:	Dr. Henny Purwaningsih, SSi, MSi and Teaching Team

Learning Outcomes Charged to Course Learning Outcomes

Learning Outcomes	A1	A2	B1	B2	B3	B4	C1	C2
A. Knowledge	✕	✕						
B. Speciafic skills			✕	✕	✕	✕		
C. General Attitudes and Skills							✕	✕

One Semester Learning Plan (RPSS):

WEEK OF	LEARNING OUTCOMES	TOPIC	METHOD	DURATION	STUDY EXPERIENCE	EVALUATION CRITERIA	OUTCOME INDICATOR
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Can: a. Explain the components of the scientific methods b. Use scientific notations, basic units, and derived units c. Determine significant numbers in measurements and calculations d. Distinguish exactness and accuracy in measurement, and determine the percentage of error	Lecture agreement ***Chemistry as a Central Science*** Theoretical foundation: (i) Scientific Methods (ii) Quantitative Measurements (iii) International System of Metrics and Units (iv) Significant Numbers	Face-to-face lectures, covering: a. Lectures b. Class Interactive Discussion c. Review of Discussion Results	2 x 50 min	a. Gain insight and explanation of Chemistry as a Central Science through visual learning b. Interaction between: (i) Students and teaching materials (ii) Students and lecturers (iii) College students c. Obtain conformity	Completeness and truth about: a. Components in the scientific method b. Use of scientific notation, base units, and derived units c. Determination of numbers is important in measurement and calculation d. Determination of Accuracy, Exactness, and Percent Error Values	90% of students answered correctly about points a-d of the assessment criteria 80% of students answered correctly about demonstrating the use of dimensional analysis

	e. Demonstrate the use of dimensional analysis to solve problems	(v) Accuracy, Exactness, and Percent Error (vi) Dimensional Analysis			/understanding of opinions, agreements, and joint decisions on a problem	e. Use of Dimensional Analysis Activeness, cooperation, responsibility, discipline, accuracy, and completeness in making questions and statements in interactive discussions	
2-3	Can: a. Explain the atomic model with a quantum approach b. Explain the periodic table and the periodicity of elements c. Describe electron and orbital configurations d. Explain atomic structure and its relation to quantum chemistry	**The Building Block of the Universe: Atoms as the Constituents of Matter** Theoretical foundation: (i) Atoms and Molecules (ii) Periodic Table and Properties (iii) Periodicity of Elements (iv) Introduction to Quantum Theory (v) Quantum Theory and Atomic Structure	Face-to-face lectures, covering: a. Lecture b. Class Interactive Discussion c. Review of Discussion Results	3 × 50 min	a. Gain insight and explanation of the building blocks of the Universe: Atoms as the constituents of matter through visual learning b. Interaction between: (i) Students and teaching materials (ii) Students and lecturers (iii) Among students c. Obtain conformity /understanding of opinions, agreements, and	Completeness and truth about: a. Atomic and Electromagnetics Spectra b. De Broglie wavelength c. Dualism of wave and particle d. Electron Transisition e. Classification of elements in the periodic table and periodic properties of elements f. Quantum Theory: Azimuth, magnetic, and electron spin quantum numbers g. Electron configuration: Pauli exclusion principle, Hund	75% of students correctly answered items a-f in the assessment criteria 85% of students correctly answered item g-i in the assessment criteria

					joint decisions on a problem	rule, and excited state h. Orbital atom: *s*. *p*. *d*, and *f* i. Periodic properties: Atomic radius, ionization energy Activeness, cooperation, responsibility, discipline, accuracy and completeness in making questions and statements in interactive discussions	
3-4	Can: a. Distinguish ionic and covalent bonds, explains the character of the bonds, and gives examples of compounds b. Explain Lewis theory and its role in the process of molecular formation c. Explain the process of molecular formation through the orbital approach d. Explain molecular geometry with an atomic orbital theory approach	**Construction of Matter: Atoms Bond to Form Molecules** Theoretical foundation: (i) Ionic Bonds and Compounds (ii) Lewis Structure (iii) Molecular Geometry (iv) Covalent Bonds	Face-to-face lectures, covering: a. Lectures b. Class Interactive Discussion c. Review of Discussion Results	3 × 50 min	a. Gain insight and explanation related to Material Construction: Atoms bond to Form Molecules through visual learning b. Interaction between: (i) Students and teaching materials (ii) Students and lecturers (iii) Among students	Completeness and truth about: a. Octet's rule and Lewis formula b. Formal charge, polar bond, and dipole moment c. Definition and character of ionic bonding and examples of ionic compounds d. Definition and character of regular covalent and coordinate covalent bonds and examples of covalent compounds	75% of students answered completely and correctly items a-e in the assessment criteria

					c. Obtain conformity /understanding of opinions, agreements, and joint decisions on a problem	e. VSPER theory and molecular geometry predictions Activeness, cooperation, responsibility, discipline, accuracy, and completeness in making questions and statements in interactive discussions	
4-5	Can: a. Describe the reaction in aqueous solutions b. Define solubility and identify soluble cations and anions c. Describe precipitation reactions and give examples d. Explain how chemical reactions and reactivity can be used for qualitative analysis	**Transforming Matter: Chemical Reactivity** Theoretical foundation: (i) Polyatom ions (ii) Reaction in Aqueous Solution (iii) Acid-Base Reaction and Titration (iv) Solubility and Precipitation Reactions	Face-to-face lectures, covering: a. Lectures b. Class Interactive Discussion c. Review of Discussion Results	2 × 50 min 2 × 50 min	a. Gain explanation of Material Transformation: Chemical Reactivity through visual learning b. Interaction between: (i) Students and teaching materials (ii) Students and lecturers (iii) Among students c. Obtain conformity /understanding of opinions, agreements, and joint decisions on a problem	Completeness and truth about: a. Polyatomic ion nomenclature b. Reactions in aqueous solutions with examples c. Acid-base reactions and their application to titration methods d. Deposition reactions and examples e. Solubility constant (*K*sp) f. The effect of namesake ions on the solubility process g. Acidity and solubility of salts h. Solubility, control reactions, and their application to	75% of students answered completely and correctly points a-h assessment criteria

						qualitative analysis Activeness, cooperation, responsibility, discipline, accuracy, and completeness in delivering questions and statements in interactive discussions	
6	Can: a. Explain the properties of gases and the non-ideality behavior of gases b. Explain molecular interactions and their role in the form of matter c. Describe colloids: their properties, types, and preparations	**Interactions Determining Physical Properties of Matter: Molecular Interactions** Theoretical foundation: (i) Gas properties (ii) Liquids and Solids	Face-to-face lectures, covering: a. Lectures b. Class Interactive Discussion c. Review of Discussion Results	2 × 50 min 2 × 50 min	a. Gain insight and explanation of the determinants of the physical properties of matter: molecular interactions through visual learning b. Interaction between: (i) Students and teaching materials (ii) Students and lecturers (iii) Among students c. Obtain conformity/understanding of opinions, agreements, and	Completeness and truth about: a. Gas properties and gas behavior: The Ideal Gas Equation and Van der Waals Equation b. The laws of Boyle, Charles, and Avogadro c. Intermolecular forces d. Liquid Properties e. Vapor Pressure and Relative Humidity f. Crystal: types and structure; liquid crystals g. Colloids: their properties, types and manufacture Activeness, cooperation, responsibility,	80% of students correctly answered items a-e in the assessment criteria 75% of students correctly answered point f in the assessment criteria 90% of students correctly answered item g in the assessment criteria

					joint decisions on a problem	discipline, accuracy, and completeness, in making questions and statements in interactive discussions	
7		Topic Construction and Transformation Video Note: Online learning materials are selected from one of the topics discussed in the teaching materials	Online Learning, including: a. Video Views (beginning of meeting) b. Interactive Discussion Forum c. Resume Drafting d. Review of Resume Results Self-paced Quiz	10 min 35 min 30 min 15 min 10 min	a. Gain insight and explanation of Material Construction and Transformation through online learning b. Compiling a resume of online materials c. Interaction between: (i) Students and teaching materials (ii) Students and lecturers d. Among students Obtain conformity /understanding of opinions, and agreements, as well as joint decisions on a problem	**Self-paced Quiz**: Completeness and correctness of the explanation of the application of Construction and Transformation of Matter in the field of Chemistry **Group Resume Assignments:** a. The correctness of identity (name, date, theme title) **b.** Suitability of resume writing systematics (Chapter Introduction to Reference Library) **c.** Completeness of the contents of the resume compiled (completeness of the information provided, representation of the material, recapitulation of the results of the discussion)	**Self-paced Quiz:** 80% of students answered correctly about the Construction and Material Transformation application **Group Resume Assignments:** 80% of students complete complete assignments completely and precisely about the application of construction and material transformation study materials

						d. Communicative language, spelling, dictionary (KBBI) Activeness, cooperation, responsibility, discipline, accuracy, and completeness in making questions and statements in interactive discussions Note: Group resume task assessment using rubrics	
MIDTERM EXAM							**20%**
8	Can: a. Distinguish reversible and irreversible reactions b. Explain entropy and calculate changes in system entropy c. Explain Gibss free energy as a criterion of the spontaneity of a process	**Prediction of the Continuity of Material Transformation:** **Thermodynamics for Reaction Prediction** Theoretical foundation: Chemical thermodynamics	Face-to-face Lectures, covering: a. Lectures b. Class Interactive Discussion c. Review of Discussion Results	2 × 50 min	a. Gain insight and explanation of the prediction of material transformation continuity: thermodynamics for reaction forecasting through visual learning b. Interact between: (i) Students and Learning Materials (ii) Students and lecturers	Completeness and truth about: a. Reversible and irreversible reactions b. Entropy and randomness c. Changes in system entropy d. Properties of the Gibss Function: Dependence on temperature and pressure e. The relationship between Gibbs free energy and the determination	75% of students correctly answered items a-e in the assessment criteria

					(iii) Among students c. Obtain conformity /understanding of opinions, and agreements, as well as joint decisions on a problem	of the spontaneity of a reaction f. Completeness and diversity of examples of applications of intermolecular interactions in agriculture, biosciences, and marine Activeness, cooperation, responsibility, discipline, accuracy, and completeness in making questions and statements in interactive discussions	
9	Can: a. Explain and predict the rate of chemical reactions b. Explain the application of chemical kinetics in determining the reaction mechanisms c. Explain the definition and several types of catalysts, and the applications of catalysts in various industries	**Rhythm and Tempo in the Transformation of Matter: Reaction Kinetics** Theoretical foundation: (i) Chemical kinetics: The rate laws (ii) Chemical kinetics: mechanisms	Face-to-face lectures, covering: a. Lectures b. Class Interactive Discussion c. Review of Discussion Results	2 × 50 min	a. Gain insight and explanation of rhythm and tempo in material transformation: reaction kinetics through visual learning b. Interaction between: (i) Students and learning materials (ii) Students and lecturers	Completeness and truth about: a. Reaction rate and determination of reaction rate b. Reaction mechanisms: elementary reactions, molecularity, and rate laws c. Homogeneous, heterogeneous, biological, and autocatalyst d. Catalyst applications in various industries	80% of students answered completely and correctly points a-d of the assessment criteria

					(iii) Among students Obtain conformity /understanding of opinions, and agreements, as well as joint decisions on a problem	Activeness, cooperation, responsibility, discipline, accuracy and completeness in making questions and statements in interactive discussions	
10-11	Can: a. Predict the movement of chemical systems toward equilibrium b. Explain acid-base equilibrium and its relation to analysis at titration c. Explain solubility equilibrium and its benefits for qualitative analysis d. Explain the basic concepts of coordination chemistry e. Explain equilibrium in coordination chemical reactions	**Dynamics of Matter Transformations: Chemical Equilibrium** Theoretical foundation: (i) Chemical Equilibrium (ii) Acid-Base Equilibria (iii) Solubility and Precipitation Reactions (iv) Transition Metal Chemistry	Face-to-face lectures, covering: a. Lectures b. Class interactive discussion c. Review of Discussion Results	4 × 50 min	a. Gain insight and explanation of the dynamics of material transformation: chemical equilibrium through visual learning b. Interaction between: (i) Students and learning materials (ii) Students and lecturers (iii) Among students c. Obtain conformity /understanding of opinions, and agreements, as well as joint decisions on a problem	Completeness and truth about: a. Dynamic equilibrium: The direction towards equilibrium b. Acid-base indicator c. Strong acid-strong base titration d. Weak acid-strong base titration e. Strong acid-weak base titration f. Solubility equilibrium and its application to qualitative analysis g. Basic concepts of coordination chemistry h. Equilibrium in the chemical coordination chemistry Activeness, cooperation,	75% of students answered completely and correctly points a-h assessment criteria

						responsibility, discipline, accuracy and completeness in making questions and statements in interactive discussions	
12-13	Can: a. Explain the relationship of electrochemical reactions and their relation to Gibss spontaneity and free energy b. Explain the process of providing materials by electrolysis methods c. Describe the nature and reactivity of molecules having carbon skeleton structure d. Identify and explain the importance of chiral carbon atoms e. Describe the types and mechanisms of organic chemical reactions f. Identify chemical innovations in a	**Innovation in Material Transformation: Fuel, Food, Medicines** Theoretical foundation: (i) Electrochemistry (ii) Organic Chemistry	Face-to-face lectures, covering: a. Lectures b. Class Interactive Discussion c. Review of Discussion Results	4 × 50 min	a. Gain insight and explanation of innovations in material transformation: fuel, food, and medicine through visual learning b. Interaction between: (i) Students and learning materials (ii) Students and lecturers (iii) Among students c. Obtain conformity /understanding of opinions, and agreements, as well as joint decisions on a problem	Completeness and truth about: a. Hubungan reaksi elektrokimia dan kespontanan The relationship of electrochemical reactions and spontaneity b. Electrochemical and electrolysis differences c. The process of providing material by electrolysis method d. Properties and chemical reactivity of carbon e. Chiral carbon atom identification and its role in determining the character of a compound f. Explain the types of reactions and mechanisms of organic chemical reactions	75% mahasiswa menjawab dengan lengkap dan benar butir a-g kriteria penilaian 75% of students answered completely and correctly points a-g of the assessment criteria

	material transformation					g. Chemical innovation in material transformation, especially in the fields of energy, food, and medicine Activeness, cooperation, responsibility, discipline, accuracy and completeness in making questions and statements in interactive discussions	
14		Video on Chemical Innovations in Matter Transformation Note: Online learning materials are selected from one of the topics discussed in the teaching materials	Online learning, covering: a. Video views b. Interactive discussion forum c. Resume drafting d. Review of resume results e. Self-paced quiz	10 min 35 min 30 min 15 min 10 min	a. Gain insight and explanation of Chemical Innovation in the Transformation of Matter b. Compiling a resume of online materials c. Interaction between: (i) Students and learning materials (ii) Students and lecturers (iii) Among students	**Self-paced Quiz**: Completeness and correctness of the explanation of **Chemical Innovation in the Transformation of Matter** **Group Resume Assignments:** a. The correctness of identity (name, date, theme title) **b.** Suitability of resume writing systematics (chapter introduction to references)	**Self-paced Quiz:** 80% of students answered correctly about chemical innovations in material transformation **Group Resume Assignments:** 80% of students complete complete and precise assignments about chemical innovations in material transformation

					d. Obtain conformity/understanding of opinions, and agreements, as well as joint decisions on a problem	**c.** Completeness of the contents of the resume compiled (completeness of the information provided, representation of the material, recapitulation of the results of the discussion) **d.** Suitability and correctness of writing scientific papers (Communicative language, spelling, dictionary) Activeness, cooperation, responsibility, discipline, accuracy, and completeness in making questions and statements in interactive discussions Note: Group resume task assessment using rubrics	
FINAL EXAM							**20%**

Assessment Design:

Learning outcomes	Assignment	Practicum and Review Session	Test			
			1	Midterm	3	Final
1. Able to explain the role of chemistry as a foundation for scientific thinking and science and technology in agriculture, marine, and tropical biosciences	√	√	√	√	√	√
2. Able to apply the concept of chemistry in constructing, transforming matter, and studying its dynamics	√	√	√	√	√	√
3. Able to explain the application of material transformation in several chemical innovations	√	√	√	√	√	√
4. Able to communicate and convey opinions and ideas logically to solve a problem and respect the opinions of others.	√	√	√	√	√	√
5. Able to collaborate and cooperate through group work in the laboratory by paying attention to aspects of safety, occupational health, and the environment.	√	√	--	--	--	--

Assessment Weights:

Evaluation Criteria	Score Range	Weighting (%)	Information
Video Task Assessment ***Quality Aspect (40%)*** File size	0-100	10	Group score

Duration Visual quality Audio quality Writing quality ***Content Aspect (60%)*** Topic Suitability Storyline Order Creativity and Originality			
Poster Task Assessment ***Content Aspect (60%)*** Topic suitability Message delivery ***Quality Aspect (40%)*** Design Images	0-100	10	Group score
Lecture Assessment • The cognitive abilities of students in this practicum are also evaluated based on the level of knowledge/introduction (C1), understanding (C2), application (C3), and analysis (C4) to complete chemical calculations contained in the practicum material • The composition of questions in the student cognitive ability evaluation activity for each level is 25%, with the assessment weight for the C4 > C3 > C2 > C1 question models • The exam question model consists of: i. MODEL 1, establishes TRUE or FALSE from a series of statements related to the subject matter topic being tested. ii. MODEL 2, choosing the right one from several answer options provided for statements/questions related to the subject matter. iii. MODEL 3, answering independently to a question/question related to the subject matter tested.			

• The composition of each question model to the overall value weight is: 20% MODEL 1, 30% MODEL 2, and 50% MODEL 3.			
Midterm Exam Final Semester Exam	0-100 0-100	30	Individual score Individual score
Practicum Assessment Quiz Work score Report	0-100	25	Individual score
Practicum Exam Competency Exam (Midterm Session) Practicum Exam (Final Session	 K/BK 0-100	 25	 Individual score
Basic Chemical Grade (KIM 1105 3(2-3)		**100**	

Evaluation Criteria:

A > 85
80 < AB ≤ 85
75 < B ≤ 80
70 < BC ≤ 75
50 < C ≤ 70
40 < D ≤ 50
E < 40

Video assignment grading rubric

No	Indicator	Assessment criteria				Poin	Nilai
		90	80	70	60		
Video Format and Quality Aspects (40%)							
1	File size	< 50 MB	40–50 MB	50–60 MB	> 60 MB		0
2	Duration	3–5 min	> 5–5.5 min	> 5.5–6 min	> 6 min		0
3	Image quality	Clearly visible	Clearly visible	Less obvious	Blurry/not visible at all		0
4	Audio quality	Heard clearly; no narrative is truncated; appropriate background music and does not cover the narration sound	It sounds clear and no narrative is cut off; using background music, but making the narration voice inaudible	Less audible, there is a truncated narrative or no narration, does not use background music	Inaudible, no narration, no background music (silent video)		0
5	Writing quality	There are titles, group identities, captions (subtitles/captions; if any) that are clearly read without disturbing the video content	There are titles, group identities, captions (subtitles/captions; if any) that are clearly legible but interfere with the video content	There is no group title or identity; Captions (subtitles/captions; if any) read clearly without disturbing the video content	There is no group title or identity; Subtitles/captions; if any) are illegible or interfere with video content		0
						Average aspect of format and quality	0
Content aspect (60%)							
1	Topic	Appropriate			Not compliant		0
2	Flow	Very good baik	Good	Fair	Less		0
3	Creativity and Originality	100% self-recorded images	The combination of self-recording images and video compilation	100% video compilation			0
						Average aspect of content	0
						Total score	**0**

Poster Assessment Rubric

Aspects/Category/Criterion	4	3	2	1
Other/text	The content of the text is short, full of information, clear legibility	Two of the good body/text criteria are met, while one of the criteria is not met	Only one of the good body/text criteria is met, while two criteria are not met	The content of the text is too long, poor information, unclear readability (all criteria are not met)
Design	Attractive colors, proportional size of constituent elements, message to be conveyed into the center of attention (all three criteria are met)	Two of the good design criteria are met, while one of the criteria is not met	Only one of the good design criteria is met, while two criteria are not met	Color, size of constituent elements, center of attention do not indicate good design (all criteria are not met)
Image	Attractive, meaningful images as message, and original (all three criteria met)	Two of the good image criteria are met, while one of the criteria is not met	Only one of the good image criteria is met, while two criteria are not met	The image is unattractive, meaningless as a message, and not original (all criteria are not met)
Purpose of message delivery	Messages are very easy for readers to capture	Messages are quite easy for readers to catch	Messages are difficult for readers to capture	The message cannot be captured by the reader

Required and Supporting Textbook:

1. McQuarrie D, Rock PA, Gallogly EB. 2011. *General Chemistry*. 4th Ed. Mill Valley (CA): University Science Books.
2. Petrucci RH e*t al*. 2017. General Chemistry Principles and modern applications. 11th ED. Pearson Canada Inc.