

General Chemistry

Module name		General Chemistry				
Module level		1 st year of Bachelor program				
Abbreviation, if applicable						
Sub-heading, if applicable						
Courses included in the module, if applicable		KI 1101 General Chemistry 1A KI 1201 General Chemistry 2A				
Semester/term		First year				
Module coordinator(s)		Dr. Bambang Prijamboedi				
Lecturer(s)		Dr. Bambang Prijamboedi				
Language		Indonesian				
Classification within the Curriculum		Compulsory courses for Bachelor Program in Biology				
Teaching format/ class hours per week during the semester		<ul style="list-style-type: none"> Lecture : 3 x 16 weeks per semester Tutorial: 1 x 16 weeks per semester Practical Class: 3 x 16 weeks per semester 				
Workload	Total Workload	296 hours; 2 courses x 3 CU				
		Face to face teaching	Structured activities	Independent study	Exam	Total
	Lecture	96	-	96	8	200
	Tutorial	-	32	-	-	32
	Practical class	48	16	-	-	64
	Total					296
Credit points		<i>General Chemistry 1A (3 CU) & General Chemistry 2A (3 CU)</i>				
Requirements						
Content	<p>1. General Chemistry 1A This course activities consist of lectures and practice with scope:</p> <ul style="list-style-type: none"> Atoms Elements and compounds Concepts of mole and stoichiometry Reaction in aqueous solution Oxidation-reduction reactions Energy and chemical reaction Thermodynamics Theory of atoms based on quantum mechanics Chemical bonding Molecular structure Properties of gases Intermolecular force and properties of liquids and solids <p>2. General Chemistry 2A This course activities consist of lectures and practice with scope:</p> <ul style="list-style-type: none"> Physical properties of solution Chemical equilibrium Molecular concept of acid and base Acid-base equilibria Solubility and simultaneous equilibria Electrochemistry Nuclear chemistry Organic and biochemical chemistry 					

After completion of this module students are expected to be able to:

1. General Chemistry 1A

Knowledge

- Identify the atoms, elements, ionic compounds, molecular compounds.
- Describe the concept of mole, limiting reactions and reaction yields.
- Identify electrolytes, acids and bases, and understand the acid-base nomenclature, molarities and reactions in solution.
- Identify the oxidation and reduction reactions.
- Describe the concept of energy and its relation with the chemical change, works, internal energy, first law of thermodynamics, Hess's law.
- Describe the concept of entropy, second and third law of thermodynamics, Gibbs free energy, bond energy.
- Describe the atomic spectra, the Bohr theory, wave model of atom, spin, atomic orbital.
- Identify ionic bonding, covalent bonding and understand the concept of polar molecule, Lewis structure.
- Identify the geometry of molecular structure, bonding types in molecules and matters.
- Describe the ideal and real gas law, Dalton's gas law.
- Describe the intermolecular forces in materials, Le chatelier principle.
- Identify the structure of crystalline solids, crystal types and its physical properties.

Skills

- Determine the relation between chemical reactions in molecular scale and macroscopic scale such as mass, empirical and molecular formula.
- Use titration methods and several chemical analyses to solve some problems related to the solution properties.
- Apply the balancing of the oxidation-reduction reactions and calculate the mass involved in the oxidation-reduction reaction.
- Determine the amount of heat that related to a chemical reaction
- Determine the molecular structure and its geometry for a chemical compound.

Competences

- Reason the relation between microscopic world in molecular level and macroscopic level through the mole and stoichiometry concepts, theory and description of atoms and molecules and its relation with the properties of materials.
- Apply some basic chemical analytical method to understand and explain some chemical phenomena and also to identify the chemical properties of common chemical substances.

2. General Chemistry 2A

Knowledge

- Describe the formation of solution and heat of solution, solubility, Henry's law, concentration units, colligative properties.
- Describe the factors that affect reaction rates, rate laws and integrated laws, mechanism of reaction.
- Describe the laws of equilibrium and Le Chatelier principles.
- Identify the acid-base properties of a molecule.
- Describe the pH concept, equilibrium properties of acid-base in solution and principles of acid-base titration.
- Identify the solubility of various compound and understand the selective precipitation
- Describe the galvanic cell, electrolysis cell, concept of reduction potential and practical application of electrochemistry.
- Describe the concept of nuclear binding energy, nuclear instability and radiation.
- Identify the organic and biochemistry compounds, polymers, nucleic acid.

	<p>Skills</p> <ul style="list-style-type: none"> • Use and converse various concentration units. • Determine the reaction mechanism. • Determine equilibrium constant and concentration at equilibria. • Determine the strength of acid and base compounds, concentration at equilibria state and using acid-base titration methods. • Determine the solubility of various compound and use selective precipitation principle to separate various ions and compounds. • Use electrochemical properties of compounds to obtain electrical energy and to modify some materials properties. • To determine the unstable nuclei and the radiation types that were emitted from unstable nuclear. • To be able to identify various organic and biochemical compound. <p>Competences</p> <ul style="list-style-type: none"> • Reason the interaction among the molecules that form solution and use it to predict the properties of solution. • Reason the rate laws and construct the mechanism of reactions. • Reason the nature of acid-base properties and determine the acidity or basicity of a compound. • To be able to use oxidation and reduction properties of atoms and compounds explain the change of compound connected with the electron movements. • Reason the nuclear instability and activities. • Reason the properties of organic and biochemical compounds from its structural properties. 	
Study/exam achievements	<ul style="list-style-type: none"> • <i>Midterm exam: 40%</i> • <i>Final exam: 40%</i> • <i>Quizzes: 10%</i> • <i>Practical class: 10%</i> 	
Forms of media	<i>Classical teaching tools:</i>	<i>white board/ chalk and talk, power point</i>
	<i>Integrated teaching tools:</i>	
	<i>Digital teaching tools:</i>	<i>internet</i>
	<i>Problem based teaching tools:</i>	<i>Experimental works</i>
Literature	<ol style="list-style-type: none"> 1. James E. Brady, Neil D. Jespersen and Alison Hyslop. 2012. Chemistry 6th Edition, John Wiley and Sons. 2. Raymond Chang. 2010. Chemistry 10th Edition, McGraw-Hill. 	