|  |  |  |
| --- | --- | --- |
| **Study:** | **Professional undergraduate study Programme *Agriculture***  Specific field of study: Course foundations | |
| **C**o**urse:** | **APPLIED CHEMISTRY** | |
| **C**o**urse Code: 161593**  **C**o**urse Status**: compulsory | **Semester:** I | **ECTS points: 5** |
| **Course holder:** | Sonja Rajić-Bistrović, mag.educ.chem.,lecturer | |
| **Modes of delivery:** | **Number of hours** | |
| Lectures | 45 | |
| Exercises | 20 | |
| Seminars | 10 | |

**Course objectives:** to acquaint students with the basics of chemistry and chemical calculus, the importance of chemical knowledge and the application of chemistry to the field of agronomy.

**Course content**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Course units** | **Modes of delivery:** | | | **Places of delivery** |
| **L** | **E** | **S** |
|  | Propedeutic teaching: Initial test |  | 1 |  | Lecture hall |
|  | Propedeutic teaching/ Teaching units: Structure of atoms, Periodic table of elements, Metals and non-metals, Types of chemical bonds, Molecular and structural chemical formulas, Basics of organic chemistry (main functional groups and characteristic chemical compounds) | 4 | 2 |  | Lecture hall |
|  | Propedeutic teaching: Final testing |  | 1 |  | Lecture hall |
| **1.** | Chemical symbols; Classification of elements and periodicity of properties; Structure of the atom | 3 |  |  | Lecture hall |
| **2.** | Chemical bonds; Chemical formulas; Chemical reaction equations | 3 |  |  | Lecture hall |
| **3.** | Solutions, electrolyte dissociation, buffers and colloids | 3 |  |  | Lecture hall |
| **4.** | Application of chemical laws in solving stoichiometric tasks | 3 |  |  | Lecture hall |
| **5.** | Biogenic elements of the 1st and 2nd PSE groups (Na, K, Ca, Mg) | 3 |  |  | Lecture hall |
| **6.** | Biogenic elements of transition metals PSE (Mn, Mo, Fe, Cu, Zn) | 3 |  |  | Lecture hall |
| **7.** | Biogenic elements 13 -18. PSE groups (N, P, O, S, Cl) | 3 |  |  | Lecture hall |
| **8.** | Water in cells and plants – diffusion, osmosis, osmotic pressure; Assimilation of mineral substances | 3 |  |  | Lecture hall |
| **9.** | Introduction to organic chemistry, hydrocarbons | 3 |  |  | Lecture hall |
| **10.** | Alcohols; Ethers; Aldehydes and Ketones; Organic acids | 3 |  |  | Lecture hall |
| **11.** | Esters; Fats; Detergents and Soaps | 3 |  |  | Lecture hall |
| **12.** | Water in the station and bill | 3 |  |  | Lecture hall |
| **13.** | Division, properties and structure of carbohydrates (sugar) and their derivatives | 3 |  |  | Lecture hall |
| **14.** | Amino acids, peptides, proteins, DNA and RNA | 3 |  |  | Lecture hall |
| **15.** | Introduction to metabolism (binding and release of energy in basic biochemical cycles) | 3 |  |  | Lecture hall |
|  | TOTAL HOURS: | 45 |  |  |  |
| **1.** | Precautions in the laboratory, working with chemicals and first aid. Laboratory equipment. Qualitative analysis. Systematics and reactions of proving cations and anions of individual elements. |  | 2 |  | Practikum |
| **2.** | Proving I. and II. analytical groups of cations (Pb, Hg, Cu) in prepared samples of solutions of unknown composition |  | 2 |  | Practikum |
| **3.** | Proving III. IV. and V. analytical groups of cations (Fe, Al, Ca, Ba, NH4+) in prepared samples of solutions of unknown composition |  | 2 |  | Practikum |
| **4.** | Demonstration of anions: chloride, sulfide, carbonate in prepared samples of solutions of unknown composition |  | 2 |  | Practikum |
| **5.** | Qualitative proof of anions: nitrates and sulfates in cations and anions in a solution of unknown composition |  | 2 |  | Practikum |
| **6.** | Qualitative proof of anions of all analytical groups in a sample solution of unknown composition |  | 2 |  | Practikum |
| **7.** | Introduction to quantitative analysis: stoichiometric calculation and dilution of solutions; weighing and basic procedures of volumetric titration methods |  | 2 |  | Practikum |
| **8.** | Dilution of solutions; Preparation of 0.1 M NaOH, determination of concentration factors of the prepared solutions |  | 2 |  | Practikum |
| **9.** | Dilution of solutions; Preparation of 0.1M HCl, determination of concentration factors of the prepared solutions |  | 2 |  | Practikum |
| **10.** | Standardization of 0.1M NaOH solution |  | 2 |  | Practikum |
|  | TOTAL HOURS: |  | 20 |  |  |
| **1.** | Fertilizer production (soil acidity and alkalinity) |  |  | 1 | Lecture hall |
| **2.** | Heavy metals in the environment |  |  | 1 | Lecture hall |
| **3.** | The carbon cycle and the greenhouse effect |  |  | 1 | Lecture hall |
| **4.** | The nitrogen cycle and the greenhouse effect |  |  | 1 | Lecture hall |
| **5.** | Oxygen: circular flow, ozone |  |  | 1 | Lecture hall |
| **6.** | Freons; acid rain and smog |  |  | 1 | Lecture hall |
| **7.** | Production of alcohol; Sugar production |  |  | 1 | Lecture hall |
| **8.** | Omega fatty acids; Plant hormones |  |  | 1 | Lecture hall |
| **9.** | Soaps and detergents |  |  | 1 | Lecture hall |
| **10.** | Vitamins and minerals |  |  | 1 | Lecture hall |
|  | TOTAL HOURS: |  |  | 10 |  |
|  | **In total** | **45** | **20** | **10** |  |

Forms of teaching: L=lectures; E=exercises; S=seminars

**Learning outcomes** (LO)

After passing the exam, the student will be able to:

LO 1. Connect the foundations of chemistry through definitions and laws

LO 2. Discover the significance and role of biogenic chemical elements in the chemical compounds that make up living organisms of plants and animals

LO 3. Determine the cation or anion in the unknown sample and record the reaction using chemical reaction equations

LO 4. Assess the stoichiometric calculation in order to accurately volumetrically create solutions of given concentrations.

LO 5. Compare the structures and mechanisms of reactions for specific groups of organic compounds

LO 6. Connect the equations of the chemical reactions of glycolysis and the citric acid cycle with the total energy yield balance of ATP

Course holder:

Sonja Rajić-Bistrović, mag.educ.chem., lecturer

Križevci, July 2024