Level: bachelor

Course title: Chemistry

Status: obligatory

ECTS: 10

Requirements: none

Learning objectives

The course is designed to provide the students with understanding of the basic principles of chemistry. To achieve this, students will study the periodic classification of the elements in terms of theoretical models and observed behaviour of elements and their compounds. It will introduce students to quantum mechanical models of electronic structure and models of bonding and enable the student to apply these models to interpret the observed behaviour of elements and their compounds. The chemistry of hydrocarbons and simple mono-functional group compounds will give elementary knowledge in organic chemistry. The student will develop the ability to solve numerical problems related to the core concepts in inorganic and organic chemistry. Students will obtain broad knowledge of the key chemical concepts that will enable them to understand facts more easily, as well as principles and theories in chemistry.

Learning outcomes

Students should be able to:

- Demonstrate understanding of the key concepts in chemistry. Solve quantitative problems.
- Apply concepts arising from quantum mechanics to the electronic structure of atoms.
- Use the electronic structures of atoms to justify the periodic classification of the elements
- Apply models of bonding and intermolecular attraction to explain properties of elements and compounds.
- Investigate and interpret the properties of elements and their compounds in terms of electronic structure and bonding.
- Describe the physical and chemical properties of the chemical elements and their inorganic compounds, hydrocarbons, and explain the reactions of simple functional groups.

Syllabus

Theoretical instruction

The basic chemical laws. Periodic classification of the elements. Atomic structure. Quantum theory and the electronic structure of atoms. Electronic structures of atoms and the periodic classification of the elements. Models of bonding. Formation of ionic, covalent and metallic bonds, bond type related to ionization energies, electron affinities and electronegativities. Molecular orbitals, energy level diagrams, linear combination of atomic orbitals (LCAO) for homonuclear and simple heteronuclear diatomic molecules, bond order and bond strength, dative covalent (co-ordinate) bonding. Intermolecular attraction. Chemical kinetics. Chemical equilibrium. Acids and bases. Acid-base equilibria, buffers and solubility equilibrium. Electrochemistry. The standard electrode potentials. Physical and chemical properties of elements and their compounds with hydrogen, interpretation of trends in terms of electronic structure and bonding, application of oxidation states and standard electrode potentials. Basic classes of organic compounds: hydrocarbons, compounds with oxygen, organic compounds with nitrogen (amines, amides).

Practical instruction. Chemical calculations: SI units, concentration, dilution, application of equilibrium to weak electrolytes, pH, buffers, solubility product; oxido-reduction.

Weekly teaching load				Other:
Lectures: 4	Exercises: 3	Other forms of teaching: 2	Student research:	