UNIWERSYTET IM. ADAMA MICKIEWICZA W POZNANIU

Basic Organic Chemistry 2

Educational subject description sheet

Basic information

Study programme Chemia (General Chemistry) **Speciality** - **Organizational unit** Faculty of Chemistry **Study level** First-cycle programme **Study form** Full-time **Education profile** General academic	**Didactic cycle** 2023/24 **Subject code** 02CENS.18K.01827.23 **Lecture languages** English **Course type** Obligatory **Block** Major subjects

Subject coordinator	Katarzyna Koroniak-Szejn
Lecturer	Katarzyna Koroniak-Szejn

Period	**Activities and hours**	**Number of ECTS points**
Semester 4	• Lecture: 30, Exam • Classes: 30, Graded credit	5

Goals

Code	Goal
C1	Transfer of knowledge in the field of the structure of organic compounds, the influence of the electronic structure on the properties of the compound and the course of organic reactions, isomerism phenomena, developing the ability to predict the course of reactions based on the knowledge of the properties and structure of compounds.
C2	Gaining the ability to write the reaction mechanisms, developing the ability to predict the influence of the environment on the properties and reactivity of organic compounds.
C3	Preparation for the planning of the transformation of organic compounds, the formation of functional groups and the transformation of one functional group into another.
C4	Developing the ability to plan organic synthesis, including multi-stage synthesis and the assessment of alternative synthesis routes.
C5	Understanding the course of a chemical reaction by understanding the reaction mechanism.

Entry requirements

Passed the course of Basics of organic chemistry 1 (3rd semester) (lecture and laboratory).

Subject learning outcomes

Code	Outcomes in terms of	Learning outcomes	Examination methods
Knowledge – Student:			
W1	knows the names of organic compounds and is aware that reactivity depends on the chemical structure of the compound, i.e. the influence of functional groups, density distribution electronic or spatial structure/conformation.	CEN_K1_W01, CEN_K1_W05, CEN_K1_W08	Written exam, Written colloquium
W2	knows the basic mechanisms of various groups of reactions in organic chemistry: substitution, elimination, addition (cycloaddition), reduction, oxidation, rearrangements, condensations, heterocyclization, annulation as well basic pericyclic reactions.	CEN_K1_W01, CEN_K1_W05, CEN_K1_W06, CEN_K1_W08, CEN_K1_W10	Written exam, Written colloquium
W3	knows various strategies for planning and implementing the organic synthesis.	CEN_K1_W05, CEN_K1_W08, CEN_K1_W12	Written exam, Written colloquium
W4	knows the terms: acid/base, electrophile/nucleophile, group leaving, electron withdrawing group (EWG), electron donating group (EDG).	CEN_K1_W05, CEN_K1_W08, CEN_K1_W10	Written exam, Written colloquium
W5	has knowledge about: isomerism of organic compounds (including stereoisomerism), resonance phenomena, tautomerisation and acid-base equilibrium of organic compounds.	CEN_K1_W01, CEN_K1_W05, CEN_K1_W12	Written exam, Written colloquium
Skills – Student:			
U1	can plan the synthesis of an organic compound.	CEN_K1_U02, CEN_K1_U03, CEN_K1_U04	Written exam, Written colloquium

Code	Outcomes in terms of	Learning outcomes	Examination methods
U2	can explain the course of a chemical reaction using the reaction mechanism and know about the properties of organic compounds.	CEN_K1_U02, CEN_K1_U03, CEN_K1_U04	Written exam, Written colloquium
U3	is able to adequately present reaction mechanisms, especially to correctly illustrate the movement of electrons and the formation and breaking of the bonds.	CEN_K1_U02, CEN_K1_U04, CEN_K1_U05	Written exam, Written colloquium
U4	can suggest the result of a chemical reaction depending on the reagents and conditions used in the reaction.	CEN_K1_U01, CEN_K1_U02, CEN_K1_U03, CEN_K1_U25	Written exam, Written colloquium
U5	can point the relation of the properties of organic compounds with their structure.	CEN_K1_U01, CEN_K1_U03, CEN_K1_U20	Written exam, Written colloquium
U6	can use literature sources, textbooks and tables.	CEN_K1_U01, CEN_K1_U02, CEN_K1_U03	Written colloquium
U7	can recognize and name different isomers of organic compounds.	CEN_K1_U01, CEN_K1_U03	Written exam, Written colloquium
Social competences – Student:			
K1	is famiiliar with the later developments in the field of organic chemistry.	CEN_K1_K02	Written exam, Written colloquium

Study content

No.	Course content	Subject learning outcomes	Activities
1.	Influence of carbon atom hybridization on the structure and reactivity of organic compounds.	W1, W5, U1	Lecture, Classes
2.	Acidity, basicity and polarity of organic molecules. Polarization of organic molecules and intra- and intermolecular interactions.	W1, W5, U2, U5	Lecture, Classes
3.	Chemical reaction. Reaction mechanism: breakage and formation of chemical bond : homolytic, heterolytic; reactions with simultaneous breakage and bond formation; kinetic i thermodynamic reaction control; examples of regio-, stereo- and chemoselective reactions.	W2, W3, W4, U2, U3, U5, U7	Lecture, Classes

No.	Course content	Subject learning outcomes	Activities
4.	Classification of reactions in organic chemistry and their mechanisms, i.e. addition reactions, elimination, substitution, condensation, rearrangements. Mechanisms of: addition (electrophilic and nucleophilic), elimination (E1 and E2, E1cB; Hoffman, Cope), substitutions (SN1, SN2, SNi, SN1', SN2'), electrophilic substitution in aromatic systems, aromatic nucleophilic substitution; condensation reactions (e.g. aldol, Claisen, cross and others variants - Dieckmann, Darzens, Perkin, Knoevenagel), conjugate addition (Michael) and Stork enamine reaction, rearrangements - classification (to carbon, nitrogen and oxygen with "electron deficit" and rearrangement to an atom electron-rich carbon atom), such as Robinson annulation or heterocyclization).	W1, W2, W3, W4, W5, U1, U2, U3, U4, U5, K1	Lecture, Classes
5.	Configuration and conformation. Newman projection, cyclic compounds and their stereochemistry, conformations of cyclohexane, chirality, ways of graphical representation of stereoisomerism, Fischer, Haworth, enantiomers and diastereoisomers, meso compounds. Specifying R and S configurations and other types stereoisomerism.	W1, W5, U5, U7	Lecture, Classes
6.	Carbohydrates (anomerization) and amino acids, aromatic heterocyclic compounds (resonance) and their fundamental reactivity. Examples of planning the synthesis of compounds organic.	W1, U2, U6, U7, K1	Lecture, Classes

Additional information

Activities	Teaching and learning methods and activities
Lecture	Lecture with a multimedia presentation of selected issues
Classes	Classes method

Activities	Credit conditions
Lecture	The condition for passing the course is passing a written exam consisting of several questions (up to 10). Passing the exercises class is required to take the exam. Grading scale with percentage distribution applied: • very good (very good; 5.0): achieving the assumed learning outcomes by the student minimum level of 92.0% • good plus (+db; 4.5): achievement by the student of the assumed learning outcomes in the field 84.0% - 91.9% • good (good; 4.0): achievement by the student of the assumed learning outcomes in the scope 76.0% - 83.9% • sufficient plus (+dst; 3.5): achieving the assumed learning outcomes by the student in range 68.0% - 75.9% • satisfactory (dst; 3.0): achievement by the student of the assumed learning outcomes in range 60.0% - 67.9% • unsatisfactory (ndst; 2.0): failure to achieve the expected learning outcomes by the student score below 60.0%

Activities	Credit conditions
Classes	In order to pass the seminar class student is required to positively pass 2 written colloquia. Grading scale with percentage distribution applied: • very good (very good; 5.0): achieving the assumed learning outcomes by the student minimum level of 92.0% • good plus (+db; 4.5): achievement by the student of the assumed learning outcomes in the field 84.0% - 91.9% • good (good; 4.0): achievement by the student of the assumed learning outcomes in the scope 76.0% - 83.9% • sufficient plus (+dst; 3.5): achieving the assumed learning outcomes by the student in range 68.0% - 75.9% • satisfactory (dst; 3.0): achievement by the student of the assumed learning outcomes in range 60.0% - 67.9% • unsatisfactory (ndst; 2.0): failure to achieve the expected learning outcomes by the student score below 60.0%

Literature

Obligatory

1. "Selected Mechanism in Organic Chemistry" - Donata Pluskota-Karwatka, Katarzyna Koroniak-Szejn, Marcin Hoffmann, Wydawnictwo Naukowe UAM
2. "Organic Chemistry" Graham Solomons

Optional

1. "Organic Chemistry" John McMurry
2. "Organic Chemistry" Jonathan Clayden

Calculation of ECTS points

Activities	Activity hours*
Lecture	30
Classes	30
Preparation for classes	25
Reading the indicated literature	10
Preparation for the exam	20
Preparation for the assessment	20
Student workload	**Hours** 135
Number of ECTS points	**ECTS** 5

* academic hour = 45 minutes

Efekty uczenia się dla kierunku

Kod	Treść
CEN_K1_K02	The graduate is ready to understand the importance of presenting selected developments in chemistry in an accessible manner
CEN_K1_U01	The graduate can use basic chemical terminology according to IUPAC and PTChem recommendations
CEN_K1_U02	The graduate can present the knowledge acquired in an accessible manner
CEN_K1_U03	The graduate can identify and justify the properties of a substance on the basis of its structure
CEN_K1_U04	The graduate can plan the implementation of chemical processes in terms of the choice of reagents and elimination of the side products formed
CEN_K1_U05	The graduate can carry out basic chemical synthesis processes
CEN_K1_U20	The graduate can use databases to retrieve information needed in the chemist's work
CEN_K1_U25	The graduate can create a presentation of a specific chemical or physicochemical problem and propose a solution to it
CEN_K1_W01	The graduate knows and understands basic chemical laws and issues
CEN_K1_W05	The graduate knows and understands the mechanisms of basic chemical reactions
CEN_K1_W06	The graduate knows and understands structure of molecules and crystals
CEN_K1_W08	The graduate knows and understands the chemical properties of substances according to their structure/composition
CEN_K1_W10	The graduate knows and understands the basic processes of chemical synthesis
CEN_K1_W12	The graduate knows and understands chemical compounds, including those discovered recently