

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: ORGANSKA KEMIJA 1
Course Title: ORGANIC CHEMISTRY 1

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
VSŠP Kemijska tehnologija, 1. stopnja	/	1.	2.
PSP Chemical Technology, 1 st Cycle	/	1 st	2 nd

Vrsta predmeta / Course Type:

obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code:

KT108

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individual Work	ECTS
60	15	/	/	/	75	5

Nosilec predmeta / Lecturer:

prof. dr. Franc Požgan / Dr. Franc Požgan, Associate Professor

Jeziki / Languages:

Predavanja / Lectures: slovenski / Slovenian

Vaje / Tutorial: slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

Nomenklatura (poimenovanje) organskih spojin.

Struktura in vezi v organskih spojinah, kislost in bazičnost. Narava kemijske vezi, vezna entalpija, hibridizacija, ionske in kovalentne vezi; struktura etana, etena in etina; polarnost vezi in elektronegativnost; toksičnost kemikalij in varno delo z njimi.

Narava organskih spojin.

Alkani in cikloalkani: nomenklatura, izomerija, konformacije; *cis-trans* izomerija pri cikloalkanah, ekvatorialni in aksialni substituenti pri cikloheksanu; fizikalne lastnosti alkanov, nafta.

Alkeni in alkini: nomenklatura, elektronska struktura, *cis-trans* izomerija, pravila sekvence in *Z,E*-konfiguracija; tipi organskih reakcij, mehanizmi in reakcijski intermediati ter prehodna stanja;

Content (Syllabus outline):

Nomenclature of organic compounds. Structure and bonding of organic compounds; acids and bases. The nature of chemical bonds, bond (dissociation) enthalpy, hybridization, ionic and covalent bonds; structure of ethane, ethene and ethyne; bond polarity and electronegativity; toxicity of chemicals and risks. The nature of organic compounds. Alkanes and cycloalkanes: nomenclature, isomerism, conformations; *cis-trans* isomerism of cycloalkanes, equatorial and axial substituents in cyclohexane; physical properties of alkanes; naphtha. Alkenes and alkynes: nomenclature, electronic structure, *cis-trans* isomerism, sequence rules and *Z,E*-configuration; kinds of organic reactions; mechanisms, reaction intermediates and

reakcijska hitrost, kinetika in termodinamika; sinteza alkenov in alkinov ter njihove pretvorbe; adicijske reakcije, mehanizmi, polimerizacija, naravni kavčuk.

Osnove stereokemije: tetraedrski ogljikov atom in stereokemija; kiralnost, optična aktivnost, absolutna konfiguracija; enantiomeri, diastereoizomeri, mezo spojine; projekcijske formule, stereokemija reakcij; kiralnost v naravi, kiralna zdravila.

Alkil halogenidi: nomenklatura, sinteza in pretvorbe alkil halogenidov; S_N1 in S_N2 reakciji, E1 in E2 reakciji, E1cb; PCB in drugi naravni polutanti.

Alkoholi, etri in fenoli: nomenklatura, lastnosti, sinteza in pretvorbe; vodikova vez, kislost alkoholov in fenolov, ciklični etri (epoksidi); etanol kot kemikalija, zdravilo in strup.

transition states; rate of the reaction, kinetics and thermodynamics; synthesis and transformations of alkenes and alkynes; addition reactions, mechanisms, polymerization; natural rubber.

Stereochemistry: tetrahedral carbon atom; chirality, optical activity, absolute configuration; enantiomers, diastereo(iso)mers, meso compounds; presentation of the structure, stereochemistry of reactions; chirality in Nature, chiral drugs. Alkyl halides: nomenclature, synthesis and transformations; S_N1 and S_N2 reactions, E1 and E2 reactions, E1cb; PCB and other pollutants in Nature. Alcohols, ethers and phenols: nomenclature, properties, synthesis and transformations; hydrogen bonding, acidity; cyclic ethers (epoxides); ethanol as chemical, drug and poison.

Temeljna literatura in viri / Readings:

- J. McMurry: Fundamentals of Organic Chemistry, Brooks/Cole Publishing Company, 4th Edition, Pacific Grove 1998, 566 pages (50%).

Supplementary reading:

(a) P. W. Atkins, M. J. Frazer, M. J. Clugston, R. A. Y. Jones: Kemija, zakonitosti in uporaba (translated by A. Kornhauser, S. A. Glažar), Tehniška založba Slovenije d. d., Ljubljana, 1997.

(b) M. Tišler: Organska kemija, 3. popravljena in dopolnjena izdaja, Državna založba Slovenije, Ljubljana, 2005.

Cilji in kompetence:

Cilj predmeta je, da študent pridobi temeljno znanje iz organske kemije tj. poznavanje nomenklature organskih spojin, poznavanje posameznih vrst organskih spojin (po funkcionalnih skupinah) in njihovih strukturnih značilnosti ter reaktivnosti, poznavanje osnov organske stereokemije, reakcijskih mehanizmov in intermediatov, poznavanje osnovnih principov organske sinteze.

Objectives and Competences:

Objectives of the course are mastering basic knowledge of organic chemistry: nomenclature, structural features, functional groups, reactivity, and typical transformations of organic compounds. Basic knowledge of organic stereochemistry, reaction mechanisms and intermediates. Knowledge of the basic principles of organic chemistry and accessing literature sources.

Competences:

Basic knowledge of organic chemistry: nomenclature, structure, reactivity, toxicity of fundamental organic compounds and basic transformations of organic compounds. Ability to understand structure-reactivity relationship, i.e. to predict chemical properties of a given

	organic compound from its structure and vice versa.
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Predvideni študijski rezultati:

<p><u>Znanje in razumevanje</u> Študent se nauči osnov organske kemije: poimenovanja organskih spojin, posameznih vrst organskih spojin (po funkcionalnih skupinah) in njihovih strukturnih značilnosti ter reaktivnosti, osnov organske stereokemije, reakcijskih mehanizmov in intermediatov ter osnovnih principov organske sinteze.</p>
<p><u>Uporaba</u> Študent pridobi temeljno znanje, ki je osnova za nadaljnji študij kemije in se navezuje na večino ostalih predmetov študija kemije. To znanje je nujno potrebno pri kasnejšem delu v praksi.</p>
<p><u>Refleksija</u> Zavedanje, da je za popolno razjasnitev kemijske reakcije potreben natančen študij vsake reakcijske stopnje.</p>
<p><u>Prenosljive spretnosti</u> Pri predmetu se študenti z reševanjem različnih problemov izurijo v uporabi znanja in analitičnega razmišljanja.</p>

Intended Learning Outcomes:

<p><u>Knowledge and Comprehension</u> Student understands and is familiar with: – Structure of organic compounds and functional groups – Isomerisation and nomenclature of organic compounds – Basic transformations of organic compounds – Typical reagents used for performing basic organic reactions</p>
<p><u>Application</u> Mastered knowledge of organic chemistry is basic knowledge needed for studying chemical engineering. The knowledge is interconnected with majority of other subjects concerning the program. Course is also fundamental for understanding biochemistry subjects and courses concerning organic materials and ecology.</p>
<p><u>Analysis</u> Student is capable of recognising different basic types of organic compounds, predict their physical properties, toxicity, reactivity, etc.</p>
<p><u>Skill-transference Ability</u> The student acquires skills that are required for a basic synthetic laboratory work and for handling with chemicals. The knowledge on organic chemistry enables better understanding of the basic principles of other subjects and courses within the study.</p>

Metode poučevanja in učenja:

Predavanja; seminarji

Learning and Teaching Methods:

Lectures, seminar work, training by analytical solving of the theoretical problems.

Delež (v %) /

Weight (in %) **Assessment:**

Načini ocenjevanja:		
Pisni izpit (nadomestita ga lahko dva pozitivno ocenjena kolokvija).		Written exam. Written exam can be passed by two positive partial exams.

Reference nosilca / Lecturer's references:

<p>1. ŠTEFANE, Bogdan, PERDIH, Franc, VIŠNJEVAC, Aleksander, POŽGAN, Franc. Novel triazole-based ligands and their zinc(II) and nickel(II) complexes with a nitrogen donor environment as potential structural models for mononuclear active sites. <i>New journal of chemistry</i>, ISSN 1144-0546, no. 1, 2015, str. 566-575, ilustr. http://pubs.rsc.org/en/content/articlepdf/2014/nj/c4nj01642d?page=search, doi:</p>

[10.1039/c4nj01642d](https://doi.org/10.1039/c4nj01642d). [COBISS.SI-ID [1536036291](https://doi.org/10.1039/c4nj01642d)]

2. WAGGER, Jernej, POŽES, Aljaž, POŽGAN, Franc. Synthesis of European pharmacopoeial impurities A, B, C, and D of cabergoline. *RSC advances*, ISSN 2046-2069, 2013, vol. 3, no. 45, str. 23146-23156, ilustr. <http://pubs.rsc.org/en/content/articlepdf/2013/ra/c3ra43417f>, doi: [10.1039/c3ra43417f](https://doi.org/10.1039/c3ra43417f). [COBISS.SI-ID [1646639](https://doi.org/10.1039/c3ra43417f)]

3. POŽGAN, Franc, DIXNEUF, Pierre H. Ruthenium(II) acetate catalyst for direct functionalisation of sp²-C-H bonds with aryl chlorides and access to tris- heterocyclic molecules. *Advanced Synthesis & Catalysis*, ISSN 1615-4150. [Print ed.], 2009, vol. 351, no. 11/12, str. 1737-1743, doi:

[10.1002/adsc.200900350](https://doi.org/10.1002/adsc.200900350). [COBISS.SI-ID [30712837](https://doi.org/10.1002/adsc.200900350)]

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