



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

<b>Predmet:</b>	<b>Kemija</b>
<b>Course title:</b>	<b>Chemistry</b>

<b>Študijski program in stopnja</b> Study programme and level	<b>Študijska smer</b> Study field	<b>Letnik</b> Academic year	<b>Semester</b> Semester
<b>Univerzitetni študijski program</b> <b>Fizika, 1. stopnja</b>		<b>2.</b> <b>2<sup>nd</sup></b>	<b>3.</b> <b>3<sup>rd</sup></b>
<b>Undergraduate university</b> <b>Programme Physics, 1.st.</b> <b>degree</b>			

**Vrsta predmeta / Course type**

**Univerzitetna koda predmeta / University course code:**

<b>Predavanja</b> Lectures	<b>Seminar</b> Seminar	<b>Vaje</b> Tutorial	<b>Lab. vaje</b> Laboratory work	<b>Terenske</b> vaje Field work	<b>Samost. delo</b> Individ. work	<b>ECTS</b>
<b>45</b>			<b>15</b>		<b>60</b>	<b>4</b>

**Nosilec predmeta / Lecturer:**

**Jeziki / Predavanja / Lectures:**   
**Languages: Vaje / Tutorial:**

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

**Vsebina:**   
**Content (Syllabus outline):**

V prvem delu so obravnavane osnovne zakonitosti in zakoni splošne kemije:

- Lastnosti snovi, kemijske formule in enačba, osnove stehiometrije
- Plinski zakoni, idealno in neidealno obnašanje plinov
- Struktura atomov, periodni sistem elementov
- Kemijske vezi in njihove lastnosti
- Raztopine, solvatacija, koncentracije raztopin, topnost
- Kisline, baze, pH, pufri

Poudarek drugega dela je na osnovah anorganske kemije, vključno z osnovami anorganske nomenklature:

- Vodik, kisik, voda
- Elementi VII. skupine: F, Cl, Br, I
- Elementi VI. skupine: S
- Elementi V. skupine: N, P
- Elementi IV. Skupine: C, Pb
- Elementi I.– III. skupine: Na, K, Ca, Mg, Al

Tretji del je namenjen osnovam organske kemije in nomenklature:

- Alkani, alkeni, alkini, izomerija
- Aromatske spojine
- Organske kisline
- Alkoholi, ogljikovi hidrati
- Etri, estri, lipidi
- Aminokisline, peptidi, proteini

In the first part, basic principles and laws of general chemistry are discussed:

- Properties of matter, chemical formulas and equations, basics of stoichiometry
- Gas laws, ideal and non-ideal behaviour of gasses
- Structure of atoms, periodic table of elements
- Chemical bonds and their properties
- Solutions, solvation, concentration of solutions, solubility
- Acids, bases, pH, buffer solutions

The emphasis of the second part is on the basics of inorganic chemistry, including basic inorganic nomenclature:

- Hydrogen, oxygen, water
- Group VII elements: F, Cl, Br, I
- Group VI elements: S
- Group V elements: N, P
- Group IV elements: C, Pb
- Group I – III elements: Na, K, Ca, Mg, Al

The third part is devoted to basic organic chemistry and organic nomenclature:

- Alkanes, alkenes, alkynes, isomerism
- Aromatic compounds
- Organic acids
- Alcohols, carbohydrates
- Ethers, esters, lipids
- Amino acids, peptides, proteins

#### Temeljni literatura in viri / Readings:

- F. Lazarini, J. Brenčič, Splošna in anorganska kemija, DZS Ljubljana (1992)
- P.W. Atkins, Kemija - zakonitosti in uporaba, TZS Ljubljana (1995)
- J. Kristl, Organska kemija (Urejeni zapiski predavanj), Univerzitetna založba UM (2017)
- M. Kristl, B. Dojer, Zbirka računskih nalog pri predmetu Kemija, FNM UM (2015)

**Cilji in kompetence:**

**Objectives and competences:**

- Kandidat bo seznanjen z osnovnimi pojmi splošne, anorganske in organske kemije
- Kandidat bo razumel vplive strukture spojin na njihove lastnosti in reaktivnost
- Kandidat bo spoznal kemizem najpomembnejših elementov in spojin prisotnih v vsakdanjem življenju, v okolju, laboratoriju in kemijski industriji

- The candidate will get acquainted with the basic conception of general, inorganic and organic chemistry
- The candidate will understand the influences of the structure of compounds on their properties and reactivity
- The candidate will know the chemistry of the most important elements and compounds in the environment, chemical laboratory and industry

#### **Predvideni študijski rezultati:**

##### **Znanje in razumevanje:**

Poznavanje osnovnih principov splošne, anorganske in organske kemije. Poznavanje pridobivanja, lastnosti in glavnih spojin izbranih reprezentativnih elementov, s poudarkom na spojinah z vodikom in kisikom. Obvladovanje osnovnega kemijskega računanja na osnovi kemijskih enačb. Razumevanje periodičnih lastnosti elementov po periodnem sistemu. Razumevanja okoljskih ciklov nekaterih elementov.

##### **Prenesljive/ključne spretnosti in drugi atributi:**

Pridobitev osnovnega kemijskega znanja potrebnega za sodelovanje pri predmetih ki zahtevajo kemijsko predznanje. Prepoznavanje elementov in spojin v okolju in njihovega vpliva. Poznavanje in predvidevanje vpliva sintetičnih spojin na okolje.

#### **Metode poučevanja in učenja:**

- Predavanja
- Laboratorijske vaje

#### **Intended learning outcomes:**

##### **Knowledge and understanding:**

Knowledge about basic principles of general, inorganic and organic chemistry. Production, properties and main compounds of selected main group elements, with the focus on hydrogen and oxygen compounds. Performing basic calculations based on chemical equations. Understanding of periodicity of element properties throughout the periodic table. Understanding of environmental elemental cycles.

##### **Transferable/Key Skills and other attributes:**

Acquirement of elementary chemical knowledge needed for attending other courses where chemical prerequisites are required. Recognition of elements and compounds in the environment and their impact. Knowledge and prediction of the influence of synthetic compounds on the environment.

#### **Learning and teaching methods:**

- Lectures
- Laboratory work

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
<ul style="list-style-type: none"> <li>Kolokvij iz vaj</li> <li>Pisni izpit</li> </ul>	25 75	<ul style="list-style-type: none"> <li>Partial exam of laboratory exercises</li> <li>Written exam</li> </ul>
Opravljene laboratorijske vaje in pozitivna ocena kolokvija sta pogoja za pristop k izpitu.		Laboratory exercises and positive grade of partial exam are required for taking the written exam.

#### Reference nosilca / Lecturer's references:

- [1. KRISTL, Matjaž, GYERGYEK, Sašo, ŠKAPIN, Srečo D., KRISTL, Janja. Solvent-free mechanochemical synthesis and characterization of nickel tellurides with various stoichiometries: NiTe, NiTe<sub>2</sub> and Ni<sub>2</sub>Te<sub>3</sub>. \*Nanomaterials\*. \[Online ed.\]. 29 July 2021, vol. 11, iss. 8, str. 1-14, ilustr. ISSN 2079-4991. DOI: 10.3390/nano11081959. \[COBISS.SI-ID 72057603\]](#)
- [2. KRISTL, Matjaž, SINANOVIĆ, Nermin, GYERGYEK, Sašo, KRISTL, Janja. Sonochemical synthesis, characterization and photocatalytic activity of Bi<sub>2</sub>Mo<sub>3</sub>O<sub>12</sub>. \*Inorganic chemistry communications\*. \[Print ed.\]. Feb. 2020, vol. 112, str. 1-5. ISSN 1387-7003. DOI: 10.1016/j.inoche.2019.107699. \[COBISS.SI-ID 22858262\]](#)
- [3. KRISTL, Matjaž, BAN, Irena, GYERGYEK, Sašo, MAVER, Uroš, STERGAR, Janja. Sol-gel preparation of Ni<sub>x</sub>Cu<sub>1-x</sub>/silica nanocomposites using different silica precursors. \*Journal of sol-gel science and technology\*. Published 18 June 2020, str. \[1-9\]. ISSN 0928-0707. DOI: 10.1007/s10971-020-05321-z. \[COBISS.SI-ID 20266755\]](#)
- [14. KRISTL, Janja, SEM, Vilma, KRISTL, Matjaž, KRAMBERGER, Branko, LEŠNIK, Mario. Effects of integrated and organic pest management with copper and copper-free preparations on tomato \(\*Lycopersicon esculentum\* Mill.\) fruit yield, disease incidence and quality. \*Food chemistry\*, ISSN 0308-8146. \[Print ed.\], April 2019, vol. 278, str. 342-349. <https://www.sciencedirect.com/science/article/pii/S030881461832017X>, doi: 10.1016/j.foodchem.2018.11.079. \[COBISS.SI-ID 4496684\]](#)
- [25. DOJER, Brina, PEVEC, Andrej, BREZNIK, Katja, JAGLIČIĆ, Zvonko, GYERGYEK, Sašo, KRISTL, Matjaž. Structural and thermal properties of new copper and nickel single-source precursors. \*Journal of molecular structure\*, ISSN 0022-2860. \[Print ed.\], 2019, str. 1-18, doi: 10.1016/j.molstruc.2019.05.047. \[COBISS.SI-ID 24538632\]](#)
- [3. DOJER, Brina, PEVEC, Andrej, JAGLIČIĆ, Zvonko, DROFENIK, Mihael, KRISTL, Matjaž. Nickel\(III\) pyridinecarboxamide complexes : solvothermal synthesis, crystal structures and magnetic properties. \*Inorganica Chimica Acta\*, ISSN 0020-1693. \[Print ed.\], 2016, vol. 446, str. 124-131, doi: 10.1016/j.ica.2016.03.002. \[COBISS.SI-ID 22046984\]](#)
- [4. HOJNIK, Nuša, KRISTL, Matjaž, FERK, Gregor, GOLOBIČ, Amalija, TUREL, Matejka, JAGLIČIĆ, Zvonko, DROFENIK, Mihael. Complexes of Eu\(III\), Tb\(III\) and Cu\(II\) with proton transfer compound between 2,6-pyridinedicarboxylic acid and 2-aminobenzothiazole : characterization of the](#)

structures and physical properties. *Journal of coordination chemistry*, ISSN 0095-8972, 2016, vol. 69, iss. 9, str. 1484-1498, ilustr., doi: [10.1080/00958972.2016.1182632](https://doi.org/10.1080/00958972.2016.1182632). [COBISS.SI ID [19527702](#)]

5. KRISTL, Matjaž, MURŠEC, Mateja, SEM, Vilma, KRISTL, Janja. Application of thermogravimetric analysis for the evaluation of organic and inorganic carbon contents in agricultural soils. *Journal of thermal analysis and calorimetry*, ISSN 1388-6150. [Print ed.], March 2016, vol. 123, iss. 3, str. 2139-2147, doi: [10.1007/s10973-015-4844-1](https://doi.org/10.1007/s10973-015-4844-1). [COBISS.SI ID [18832918](#)]