

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet	Splošna in anorganska kemija
Course name	General and inorganic chemistry

Študijski program in stopnja Study program and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Fizika in Astrofizika I. stopnja	/	2	1
Physics and Astrophysics I. level	/	2	1

Vrsta predmeta / Course type	izbirni / elective
Univerzitetna koda predmeta / University course code	1FTS10

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Lab. work	Teren. vaje Field work	Samost. delo Indiv. work	ECTS
45	/	15	/	/	120	6

Nosilec predmeta / Lecturer	doc. dr. Andraž Mavrič	
Jeziki / Languages	Predavanja / Lectures	slovenščina / English
	Vaje / Tutorial	slovenščina / English

Pogoji za opravljanje študijskih obveznosti

Prerequisites

Študent mora imeti osnovna srednješolska znanja iz splošne in anorganske kemije.	The course requires fundamental knowledge of general chemistry obtained during the upper secondary education.
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Vsebina	Syllabus outline
1. Osnove strukture atomov in molekul 2. Poimenovanje enostavnih spojin in osnove kemijske nomenklature 3. Osnovni kemijski zakoni, osnove kemijskega računanja, urejanje kemijskih reakcij, limitni reaktant, izkoristek kemijske reakcije 4. Osnove termodinamike, kemijsko ravnotežje, vplivi na ravnotežne reakcije, kemijska kinetika, kataliza 5. Kemijske vezi, geometrija molekul 6. Molekulske interakcije, agregatna stanja, lastnosti ionskih, kovalentnih, kovinskih in molekularnih kristalov. 7. Tekočine, raztopine, koligativne lastnosti, raztopine elektrolitov, disociacija. 8. Različne definicije kislin in baz, soli, pH. Močni elektroliti, šibki elektroliti, pufri.	1. Fundamentals of the structure of atoms and molecules 2. Naming of simple compounds and basics of chemical nomenclature 3. Basic chemical laws, basics of chemical calculation, balancing chemical reactions, limiting reactant, efficiency of chemical reaction 4. Fundamentals of thermodynamics, chemical equilibrium, effects on equilibrium reactions, chemical kinetics, catalysis 5. Chemical bonds, geometry of molecules 6. Molecular interactions, aggregate states, properties of ionic, covalent, metallic and molecular crystals. 7. Liquids, solutions, colligative properties, electrolyte solutions, dissociation.



9. Oksidacija in redukcija (redoks reakcije), elektrokemija.
10. Koordinacijske spojine.
11. Vodik in kisik
12. Lastnosti, uporaba in pretvorbe reprezentativnih kemijskih elementov ter njihovih najpomembnejših spojin.
13. Prehodni elementi
14. Rokovanje z laboratorijsko opremo in reagenti, varnost in higiena v kemijskem laboratoriju

8. Different definitions of acids and bases, salts, pH. Strong electrolytes, weak electrolytes, buffers.
9. Oxidation and reduction (redox reactions), electrochemistry.
10. Coordination compounds.
11. Hydrogen and oxygen
12. Properties, uses and transformations of representative chemical elements and their most important compounds.
13. Transition elements
14. Handling of laboratory equipment and reagents, safety and hygiene in the chemical laboratory

Temeljni literatura in viri / Basic readings

P. Atkins, D.F. Shriver: *Inorganic Chemistry*, Oxford University Press, 5th Ed. (2010).

F. Lazarini, J. Brenčič: *Splošna in anorganska kemija*, Visokošolski učbenik, Založba FKKT UL, Ljubljana, 2004.

U. Černigoj, M. Bavcon Kralj, *Kemijsko računanje: zbirka nalog z rešitvami za študente Okolja in drugih naravoslovnih programov*, Univerza v Novi Gorici, 2010.

N. Bukovec, N. Bulc, B. Čeh, A. Demšar, A. Golobič, I. Leban, B. Modec, P. Šegedin: *Vaje iz anorganske kemije – Zbirka nalog*, Visokošolski učbenik, Založba FKKT UL, Ljubljana, 2008.

Cilji in kompetence	Objectives and competences
<p>Cilji:</p> <ul style="list-style-type: none">- osvojitev osnovnih pojmov s področja splošne in anorganske kemije;- osvojitev splošnih principov anorganske kemije in kemijskega računstva- osvojitev nekaterih eksperimentalnih laboratorijskih rutin <p>Kompetence:</p> <p>Študent bo sposoben uporabljati pridobljeno znanje pri študiju fizike pri vseh problemih povezanih s kondenzirano snovjo, znal bo uporabiti pridobljeno znanje za reševanje, razlago ali analizo fizikalnih problemov. Spoznal se bo z nomenklaturo anorganskih</p>	<p>Objectives:</p> <ul style="list-style-type: none">- understanding of basic concepts of general and inorganic chemistry;- understanding of basic principles of inorganic chemistry and chemical calculations- gaining basic experimental laboratory skills <p>Competences:</p> <p>The student will be capable of using the acquired knowledge for studying physical problems related to condensed matter. The student will be able to use the knowledge for solving, interpreting, and analysing physical problems. The student will gain insight into the nomenclature of inorganic compounds and be</p>

spojin ter bo zmožen izvesti osnovne stehiometrične izračune.

able to perform the basic stoichiometric calculations.

Predvideni študijski rezultati	Intended learning outcomes
Po opravljenem izpitu je študent seznanjen z osnovami splošne in anorganske kemije, strukturami in lastnostmi anorganskih spojin, osnovnimi reakcijami in tipi reakcijskih mehanizmov. Študent je sposoben kritične analize pridobljenih podatkov ter uporabe primernih konceptov. Študent pridobi ustrezne veščine za uporabo laboratorijske opreme in varno izvedbo kemijskih poskusov. Nauči se varno rokovati s kemikalijami.	After this course, the student is familiar with the fundamentals of inorganic chemistry: structures and properties of inorganic compounds, basic reactions, and basic types of mechanisms. The student can critically analyse the available data and appropriately use the concepts. The student obtains the know-how about the use of basic laboratory equipment, safely conduction of experiments, and learns how to handle chemicals.

Metode poučevanja in učenja	Learning and teaching methods
- predavanja - demonstracijski laboratorijski eksperimenti - računske vaje	- lectures - demonstrative laboratory experiments - tutorial

Načini ocenjevanja	Utež / Weight (%)	Assessment
- kolokviji, pisni izpit - ustni izpit	50 50	- written tests, written exam - oral exam

Reference nosilca / references of the course principal

Dr. Andraž Mavrič je docent za področje kemije na Univerzi v Novi Gorici.

Dr. Andraž Mavrič is an assistant professor of chemistry at the University of Nova Gorica.

- Mavrič Andraž, Fanetti Mattia, Lin Yiting, Matjaž Valant, Cui Chunhua. Spectroelectrochemical Tracking of Nickel Hydroxide Reveals Its Irreversible Redox States upon Operation at High Current Density, *ACS Catalysis*, 2020, 10(16), 9451-9457.
- Mavrič Andraž, Cui Chunhua. Advances and challenges in industrial-scale water oxidation on layered double hydroxides. *ACS applied energy materials*, 2021, 4(11), 12032–12055.
- Rozman Martin, Mavrič Andraž, Kravanja Gregor, Valant Matjaž, Pakseresht Amirhossein. Ultra-low-cost, flexible and durable electrochromic tape device based on aluminum foil. *Electrochimica Acta*. 2022, 404, 139760.
- Jiang Jiexuan, Mavrič Andraž, Pastukhova Nadiia, Valant Matjaž, Zeng Qiugui, Fan Zeyu, Zhang Beibei, Li Yanbo. Co-evaporation of doped inorganic carrier selective layers for high-performance inverted planar perovskite solar cells. *Solar RRL*. 2022, 2200091.
- Valant Matjaž, Luin Uroš, Fanetti Mattia, Mavrič Andraž, Vyshniakova Kateryna, Siketić Zdravko, Kalin Mitjan. Fully transparent nanocomposite coating with an amorphous alumina matrix and exceptional wear and scratch resistance. *Advanced functional materials*, 2016, 26(24), 4362-4369.

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