



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Ime predmeta:	Splošna kemija
Course title:	General Chemistry

Študijski program in stopnja Study programme and cycle	Študijska smer Study option	Letnik Year of study	Semester Semester
Predmetni učitelj, usmeritev Izobraževalna kemija, enovit magistrski študij		1.	1.
Subject teacher, the major subject Educational Chemistry, Uniform master's studies		1 st	1 st

Vrsta predmeta (obvezni ali izbirni) /
Course type (compulsory or elective)

Obvezni

Compulsory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial			Klinične vaje Clinical training	Druge oblike študija Other forms of study	Samost. delo Individual work	ECTS
45		AV	LV	RV			180	10
		15	60					

Nosilec predmeta / Course coordinator:

IRENA BAN

Jeziki /Languages:

Predavanja / Lectures:

Slovenski /Slovene

Vaje / Tutorial:

Slovenski /Slovene

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

Študent mora uspešno opraviti vse načine ocenjevanja. Za pristop k teoretičnemu izpitu je potrebna 100 % prisotnost na laboratorijskih vajah in opravljen kolokvij.

Prerequisites for enrolling in the course or for performing study obligations:

The student must successfully complete all assessment methods. To take the theoretical exam, 100% attendance at laboratory work and passing the midterm exam is required.

Vsebina (kratek pregled učnega načrta):

Predmet zajema osnovne vsebine splošne kemije

- Sodobna kemija in principi zelene kemije (praktični primeri); atomska varčnost/ vs. izkoristek kemijske reakcije
- Snovi** (lastnosti snovi, zakonitosti kemijskih sprememb)

Content (syllabus outline):

The subject comprises the basic contents of general chemistry

- Modern chemistry and principles of green chemistry (practical examples); atomic economy/ vs. chemical reaction efficiency
- Matter** (properties of substances, laws chemical changes)

- Fizikalne lastnosti, toksičnost, stabilnost in razpad lahko predpostavimo na osnovi strukture
- **Materija** v plinskem stanju (plinski zakoni, idealni plin, realni plin, kinetična teorija) Poudarek na onesnaženosti zraka .Vplivi podnebnih sprememb.
- **Termokemija** (prvi in drugi zakon termodinamike, entalpija, entropija, Gibbsova prosta entalpija) Viri energije ter zamenjava fosilnih goriv z obnovljivimi viri-primeri

Periodni sistem (izvor elementov, zgradba atoma, elementarni delci)

Študij periodnega sistema vključuje relativno številčnost in toksičnost elementov ter njihovo uporabo v različnih produktih

- **Vezi med atomi** (kemijske vezi in njihove lastnosti)
Pomen polarnih vezi: pri interakciji toplotenec/topilo in reaktivnosti; Polarne vezi kot center življenja vseh živih bitij.
- **Raztopine** (topnost, hidratacija, koncentracija raztopin, koligativne lastnosti)
- **Kislina in baze** (Definicije, Reakcije in Lastnosti)
- **Kemijska kinetika** (red reakcije, reakcijski mehanizmi, kataliza). Kataliza - vloga pri povečanju selektivnosti in učinkovitost kemijskih reakcij.
- **Kemijsko ravnotežje in zakon o vplivu mas** (disociacija šibkih kislin in baz, ionski produkt, definicija pH, hidroliza, pufri)
- **Elektrokemija** (vodikov peroksid, redoks reakcije, redoks potenciali, galvanski členi, elektroliza)
- **Medmolekulske vezi** (Van der Waalove vezi, lastnosti vezi, primeri)
- **Koordinacijske spojine** (značilnosti, kemijska vez, magnetne in optične lastnosti)

- Physical properties, toxicity, stability and degradation can be predicted based on structure
- **Matter in the gaseous state** (gas laws, ideal gas, real gas, kinetic theory)
Emphasis on air pollution. Impacts of climate change.
Thermochemistry (first and second laws of thermodynamics, enthalpy, entropy, Gibbs free enthalpy). Energy sources and production and replacement of fossil fuels with renewable sources - examples

Periodic system

Periodic system of elements, origin of elements, structure of atom and elementary particles.

- The study of the periodic table include the relative abundance and toxicity of elements and their uses in various products.

Bonds between atoms (chemical bonds and their properties)

- The importance of polar bonds: in the solute/solvent interactions and reactivity; Polar bonds as center of life for all living beings.
- **Solutions** (solubility, hydration, concentration of solutions, colligative properties)
- **Acids and bases** (Definitions, Reactions and Properties)
- **Chemical kinetics** (reaction order, reaction mechanisms, catalysis). Catalysis meaning in increasing the selectivity and efficiency of chemical reactions.
- **Chemical equilibrium and the law of mass influence** (dissociation of weak acids and bases, ionic product, pH definition, hydrolysis, buffers)
- **Electrochemistry** (hydrogen peroxide, redox reactions, redox potentials, galvanic cells, electrolysis)
- **Intermolecular bonds** (Van der Waals bonds properties, examples)
- **Coordination compounds** (characteristics, chemical bond, magnetic and optical properties)

Temeljni literatura in viri / Reading materials:

- M. Drofenik, »Splošna in anorganska kemija«, Fakulteta za kemijo in kemijsko tehnologijo – Univerza v Mariboru (2013)
- D. F. Shriver, P.W. Atkins, Inorganic Chemistry, Oxford-University Press, 5th Ed (2010)

Dodatna priporočena literatura:

- F. Lazarini in J. Brenčič: »Splošna in Anorganska kemija«, Založba FKKT, Ljubljana (2011)
- Burrows, Holman, Lancaster, Overton, Parsons, Pilling & Price, Chemistry³ 4e, Oxford-University Press, 4th Ed (2021)
- J. C. Kotz, P. M. Treichel, Jr., J. Townsend, D. Treichel, »Chemistry and Chemical Reactivity«, Saunders College Publishing, Philadelphia (2014)
- D. W. Oxtoby, H. B. Gillis, H. Nachtrieb, »Principles of Modern Chemistry«, Saunders College Publishing, Philadelphia (2012)

Cilji in kompetence:

Cilji

Študent bo poglobil in nadgradil znanje splošne kemije, pridobljeno v srednji šoli. Razumel bo osnovne kemijske zakonitosti in se seznanil z osnovami kvantitativnega obravnavanja lastnosti in zgradbe snovi ter njenega vpliva na kemijske lastnosti snovi.

Kompetence

Študent pozna in razume osnovne kemijske zakonitosti, principe in teorije, ter jih zna uporabiti pri reševanju problemov (kvalitativno in kvantitativno). Sposoben je poiskati in ovrednotiti določene podatke o snoveh in jih zna povezati z njihovimi lastnostmi. Študent razume osnovne principe zelene kemije in kemijskega inženirstva, ki omogočajo širši vpogled v vlogo kemije v trajnostnem razvoju.

Objectives and competences:

Objectives

The student will deepen and upgrade the knowledge of general chemistry acquired in secondary school. He/She will understand the basic chemical laws and get acquainted with the basics of quantitative treatment of the properties and structure of substances and its impact on the chemical properties of substances.

Competences

The student knows and understands the basic chemical laws, principles and theories, and knows how to use them in solving simple problems (qualitatively and quantitatively). He/She is able to find and evaluate certain data on substances and is able to relate them to their properties. The student understands the basic principles of green chemistry and chemical engineering, which provide a broader insight into the role of chemistry in sustainable development.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Študent je sposoben naštet, opisati in razložiti osnovne kemijske zakonitosti.
- Kemijske zakonitosti je sposoben povezati z zgradbo in lastnostmi snovi in kemijskimi reakcijami.
- Študent je sposoben oceniti, ovrednotiti pomen osnovnih kemijskih zakonitosti in teoretičnega znanja za razlago eksperimentalnih dejstev in lastnosti snovi.

Intended learning outcomes:

Knowledge and Understanding:

- Student knows and understands: basic chemical principles and is able to relate them to the structure and properties of matter and chemical reactions.
- Student is able to evaluate the meaning of basic chemical principles and theoretical knowledge for an explanation of experimental facts and properties of compounds.

Študent zna poiskati podatke iz strokovne literature. Podatke iz virov medmrežja zna kritično ovrednotiti. Uporabljeni strokovni jezik (pisno in ustno). Prenesljive/ključne spretnosti in drugi atributi: Pridobitev kemijskih znanj potrebnih za razumevanje ostalih kemijskih predmetov (organska, analizna in fizikalna kemija). Pridobitev splošnega kemijskega znanja za sodelovanje pri ostalih tehnoloških in naravoslovnih predmetih po programu Kemijsko inženirstvo UN.	Student is able to find data from professional literature. He/she is able to critically evaluate the data from the internet and to use the professional language (written and spoken). Transferable/Key Skills and other attributes: Acquisition of chemical knowledge necessary for understanding other chemical subjects (organic, analytical and physical chemistry). Acquisition of general chemical knowledge for participation in other technological subjects and natural science subjects in the Chemical engineering program.
---	---

Metode poučevanja in učenja:

Predavanja
Seminarske vaje
Laboratorijske vaje

Learning and teaching methods:

Lectures
Seminar exercises
Laboratory work

Načini ocenjevanja:

Delež/Share (%)

Assessment methods:

- kolokvij - teoretični izpit	50 50	Student has to pass successfully the following obligations: • mid-term exam • theoretical exam Conditions to pass to the calculus part of exam are two partial written tests from laboratory course (each min. 50% of all possible points) or final test (min. 60% of all possible points), which represents the calculus part of exam and completely performed laboratory course. Student has to pass successfully the following obligations: - the calculus part of exam (lab course) - the theoretical part of the exam
--	---------------------	--

Reference nosilca / Course coordinator's references:

BAN, Irena, DROFENIK, Mihael, BUKŠEK, Hermina, PETRINIĆ, Irena, HÉLIX-NIELSEN, Claus, VOHL, Sabina, GYERGYEK, Sašo, STERGAR, Janja. Synthesis of magnetic nanoparticles with covalently bonded polyacrylic acid for use as forward osmosis draw agents. *Environmental science. Water research & technology*. 2023, vol. 9, str. 442-453, ilustr. ISSN 2053-1419. [Digitalna knjižnica Univerze v Mariboru – DKUM](#), DOI: [10.1039/D2EW00539E](#). [COBISS.SI-ID [132088835](#)]

PETRINIĆ, Irena, STERGAR, Janja, BUKŠEK, Hermina, DROFENIK, Mihael, GYERGYEK, Sašo, HÉLIX-NIELSEN, Claus, BAN, Irena. Superparamagnetic Fe₃O₄@CA nanoparticles and their potential as

draw solution agents in forward osmosis. *Nanomaterials*. [Online ed.]. 4 Nov. 2021, vol. 11, iss. 11, 17 str., ilustr. ISSN 2079-4991. DOI: [10.3390/nano11112965](https://doi.org/10.3390/nano11112965). [COBISS.SI-ID [85953027](https://cobiss.si/85953027)]

VOHL, Sabina, BAN, Irena, DROFENIK, Mihael, BUKŠEK, Hermina, GYERGYEK, Sašo, PETRINIĆ, Irena, HÉLIX-NIELSEN, Claus, STERGAR, Janja. Microwave Synthesis of Poly(Acrylic) Acid-Coated Magnetic Nanoparticles as Draw Solutes in Forward Osmosis. *Materials*. 2023, vol. 16, iss. 11, [article no.] 4138, 15 str. ISSN 1996-1944. [Digitalna knjižnica Univerze v Mariboru – DKUM](https://digitalna.knjiznica.univerze-v-mariboru-dkum.si/), DOI: [10.3390/ma16114138](https://doi.org/10.3390/ma16114138). [COBISS.SI-ID [154963715](https://cobiss.si/154963715)]

KRAMER, Stanko, STERGAR, Janja, BAN, Irena, IMPERL, Jernej, KOLAR, Mitja, KRAJNC, Peter. Magnetic open porous microspheres via high internal phase emulsion templating as efficient Pb adsorption material. *Reactive and functional polymers*. Nov. 2023, [article no.] 105724, 9 str. ISSN 1873-166X. DOI: [10.1016/j.reactfunctpolym.2023.105724](https://doi.org/10.1016/j.reactfunctpolym.2023.105724). [COBISS.SI-ID [164978691](https://cobiss.si/164978691)]