Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

| UČNI NAČRT PREDMETA / COURSE SYLLABUS | |
|---|---|
| **Ime predmeta:** | **Splošna kemija** |
| **Course title:** | **General Chemistry** |

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

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| **Vrsta predmeta (obvezni ali izbirni) / Course type (compulsory or elective)** | Obvezni<br>**compulsory** |
| **Univerzitetna koda predmeta / University course code:** | |

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

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| **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:** | **Prerequisites for enrolling in the course or for performing study obligations:** |
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| Pričakuje se osnovno znanje kemije po programu srednješolskega izobraževanja.<br>Za pristop k teoretičnemu izpitu je potrebna 100 % prisotnost na vajah in opravljen test iz Splošne kemije. | Basic knowledge of chemistry is expected after the secondary school education program.<br>To take the theoretical exam, he/she needs 100% attendance at the laboratory exercises and a test in General Chemistry. |

| **Vsebina (kratek pregled učnega načrta):** | **Content (syllabus outline):** |
|---|---|
| Predmet zajema osnovne vsebine splošne kemije<br>• **Snovi** (lastnosti snovi, zakonitosti kemijskih sprememb)<br>• **Materija** v plinskem stanju (plinski zakoni, idealni plin, realni plin, kinetična teorija) | The subject comprises the basic contents of chemistry |

- **Termokemija** (prvi in drugi zakon termodinamike, entalpija, entropija, Gibbsova prosta entalpija)
- **Periodni sistem** (izvor elementov, zgradba atoma, elementarni delci)
- **Vezi med atomi** (kemijske vezi in njihove lastnosti)
- **Raztopine** (topnost, hidratacija, koncentracija raztopin, koligativne lastnosti)
- **Kisline in baze** (definicije, reakcije in lastnosti)
- **Kemijska kinetika** (red reakcije, reakcijski mehanizmi, kataliza)
- **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 Waalsove vezi, lastnosti vezi, primeri)
- **Koordinacijske spojine** (značilnosti, kemijska vez, magnetne in optične lastnosti)

**Laboratorijske vaje**
Formule kemijskih spojin, plinski zakoni, priprava raztopin, topnost, elektrolitska disociacija, kemijsko ravnotežje, topnostni produkt, reakcije - oksidacije in redukcije.

**Avditorne vaje**

Se izvajajo kot seminarske vaje iz stehiometrijskih izračunov in so priprava na test.

- **Matter** (properties of substances, laws chemical changes)
- **Matter in the gaseous state** (gas laws, ideal gas, real gas, kinetic theory)
- **Thermochemistry** (first and second laws of thermodynamics, enthalpy, entropy, Gibbs free enthalpy)
- **Periodic system** (origin of elements, structure atoms, elementary particles)
- **Bonds between atoms** (chemical bonds and their properties)
- **Solutions** (solubility, hydration, concentration of solutions, colligative properties)
- **Acids and bases** (Definitions, Reactions and Properties)
- **Chemical kinetics** (reaction order, reaction mechanisms, catalysis)
- **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 bons properties, examples)
- **Coordination compounds** (characteristics, chemical bond, magnetic and optical properties)

**Laboratory work**
Chemical stoichiometry, the gas laws, preparation of solutions, solubility, electrolytic dissociation, chemical equilibrium, solubility product, oxidation-reduction reactions.

**Tutorials**

They are conducted as seminar exercises in stoichiometric calculations and are a preparation for the test.

**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)
- J. C. Kotz, P. M. Treichel, Jr., J.Townsend, D.Treichel, «Chemistry and Chemical Reactivity«, Sounders College Publishing, Philadelphia (2014)
- D. W. Oxtoby, H. B. Gillis, H. Nachtrieb, »Principles of Modern Chemistry«, Sounders 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.

**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.

**Predvideni študijski rezultati:**

**Znanje in razumevanje**:

- našteti, 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.
- Študent zna poiskati podatke iz strokovne literature. Podatke iz virov medmrežja zna kritično ovrednotiti. Uporabljati zna strokovni jezik (pisno in ustno).

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

**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.
- 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 proffesional language (written and spoken).

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

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|---|---|
| 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 študijskem programu. | 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 study program. |

| **Metode poučevanja in učenja:** | **Learning and teaching methods:** |
|---|---|
| Predavanja z uporabo Power Point prezentacij<br>Seminarske vaje<br>Uporaba interneta | Lectures using Power Point presentation<br>Auditorial exercises<br>Use of internet |

| **Načini ocenjevanja:** | **Delež**/Share (%) | **Assessment methods:** |
|---|---|---|
| Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:<br>Pogoj za pristop k teoretičnemu delu izpita sta:<br>opravljena dva delna pisna testa (vsak opravljen z najmanj 50 % možnih točk) oz. zaključni pisni test iz vaj (opravljen z najmanj 60 % možnih točk), ki predstavljajo računski del izpita ter v celoti opravljene laboratorijske vaje.<br>Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:<br>• računski del izpita (vaje)<br>• teoretični del izpita | 50<br>**50**<br>**50** | **Student has to pass successfully the** following obligations:<br>**Conditions to access to the the calculus part of exam are**:<br>**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.<br>**Student has to pass successfully the** following obligations:<br>• the calculus part of exam (lab course)<br>• the theoretical part of the exam |

**Reference nosilca / Course coordinator's references:**

1. Synthesis and characterization of novel \gama−$Fe_2O_3$−$NH_4OH$@$SiO_2$(APTMS)nanoparticles for dysprosium adsorption. - Soavtorji: Irena Ban, Aleksandra Lobnik, Aljoša Košak. - Članek št.: 120764. - Abstract. - Bibliografija: str. 13-14. - V: Journal of hazardous materials. - ISSN 0304-3894. - Vol. 378 (Oct. **2019**), str. 1-14. - doi: 10.1016/j.jhazmat.2019.120764. - 677.017:577. - COBISS.SI-ID 22448918

2. Superparamagnetic $Fe_3O_4$@CA nanoparticles and their potential as draw solution agents in forward osmosis [Elektronski vir] / Irena Petrinic ... [et al.]. - E-članek. - Ilustr. - Nasl. z nasl. zaslona. - Soavtorji: Janja Stergar, Hermina Bukšek, Miha Drofenik, Sašo Gyergyek, Claus Hélix-Nielsen and Irena Ban. - Opis vira z dne 22. 11. 2021. - Bibliografija: str. 15-17. - Abstract. - V: Nanomaterials (Basel). - ISSN 2079-4991. - Vol. 11, iss. 11 (4 Nov. **2021**), 17 str. - doi: 10.3390/nano11112965. - 620.3. - COBISS.SI-ID 85953027

3. Synthesis of poly-sodium-acrylate (PSA)-coated magnetic nanoparticles for use in forward osmosis draw solutions [Elektronski vir] / Irena Ban ... [et al.]. - El. članek. - Ilustr. - Nasl. z nasl. zaslona. - Opis vira z dne 4. 9. 2019. - Soavtorji: Sabina Markuš, Sašo Gyergyek, Miha Drofenik, Jasmina Korenak, Claus Helix-Nielsen and Irena Petrinić. - Bibliografija: str. 16-17. - Abstract. - V: Nanomaterials (Basel). - ISSN 2079-4991. - Vol. 9, iss. 9 (1238) (Sep. **2019**), str. 1-17. - doi: 10.3390/nano9091238. - 620.3. - COBISS.SI-ID 22557462

4. Sol-gel preparation of $Ni_xCu_{1-x}$/silica nanocomposites using different silica precursors. - E-članek. - Nasl. z nasl. zaslona. - Opis vira z dne 19. 6. 2020. - Soavtorji: Irena Ban, Sašo Gyergyek, Uroš Maver, Janja Stergar. - Bibliografija: str. 8-9. - Abstract. - V: Journal of sol-gel science and technology. - ISSN 0928-0707. - (Published 18 June **2020**)**,** str. [1-9]. - doi: 10.1007/s10971-020-05321-z. - 543.9. - COBISS.SI-ID 20266755

5. Adsorption of rare earth metals from wastewater by nanomaterials : a review / Tina Kegl ... [et al.]. - Soavtorji: Aljoša Košak, Aleksandra Lobnik, Zoran Novak, Anita Kovač Kralj, Irena Ban. - Članek št.: 121632. - Abstract. - Bibliografija: str. 26-29. - V: Journal of hazardous materials. - ISSN 0304-3894. - Vol. 386 (15 March **2020**), str. 1-29. - doi 1016/j.jhazmat.2019.121632. - 628.3:620.3. - COBISS.SI-ID 22845718