



Univerza v Mariboru

Medicinska fakulteta

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Kemija
Course title:	Chemistry

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Splošna medicina/General Medicine 2. stopnja/2nd Degree		1	1

Vrsta predmeta / Course type

Obvezni/Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
30	0	0	30		30	3

Nosilec predmeta / Lecturer:

prof. dr. Željko Knez, član SAZU

Jeziki /

Predavanja / Lectures: Slovenski/Slovene

Languages:

Vaje / Tutorial: Slovenski/Slovene

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

Prerequisites:

Vsebina:

- Zgradba atoma, kemične vezi, medmolekulske sile, biološko pomembni elementi, radioizotopi.
- Voda: strukture, lastnosti, H-vezi, hidrofobne interakcije, voda kot topilo.
- Raztopine: raztapljanje plinov v vodi, koligativne lastnosti raztopin, osmotski pojavi v celici, osmодиuretiki.
- pH: ionizacija vode, Kw, pH, šibki in močni elektroliti, kisline in baze, pufri, puferski sistemi v organizmu, porazdelitev ionov v organizmu, biološki pomen pH.
- Oksidoredukcija: definicije, kvantitativna karakterizacija redoks reakcij.
- Redoks potencial in reakcijska prosta entalpija.
- Hitrost kemičnih reakcij: definicije, red in molekularnost reakcij.
- Hitrost kemičnih reakcij in ravnotežje.
- Vpliv koncentracije, pH, ionske moči in temperature na hitrost reakcije.
- Molekulske osnove življenja: biološko pomembni elementi, ioni in biomolekule.
- Organske biomolekule: izomerija, medsebojni vpliv funkcionalnih skupin.
- Pregled organskih spojin po funkcionalnih skupinah.

Content (Syllabus outline):

- Structure of atom, chemical bond and intermolecular forces, biologically important elements, radioisotopes.
- Water: structures, properties, H-bound, hydrophobic interactions, water as solvent.
- Solutions: solubility of gases in water, colligative properties of solutions, osmotic phenomenon in the cell, osmo-diuretics agents.
- pH: ionization of water, Kw, pH, weak and strong electrolytes, acids and bases, buffers, buffer systems in organism, distribution of ions in the body, biological importance of pH.
- Oxidoreduction: definition, quantitative characterization of redox reactions.
- Redox potential and reaction free enthalpy.
- Kinetics of chemical reactions: definitions, order and molecularity of reactions.
- Kinetics and equilibrium of chemical reactions.
- Influence of concentration, pH, ionic power and temperature on chemical reaction.
- Molecular basics of life: biological important elements, ions and biomolecules.
- Organic biomolecules: isometry, interacting influence of functional groups.

- Biološko pomembne organske molekule s primeri v medicini.
- Kemija ogljikovih hidratov: monosaharidi, disaharidi, polisaharidi, homoglikani in heteroglikani.
- Kemija lipidov in steroidov.
- Aminokisliline.
- Nukleotidi in nukleinske kisline.
- Vitamini.
- Molekularno modeliranje medicinsko pomembnih molekul in zdravil.

- Review of organic substances according to their functional groups.
- Biologically important organic molecules with examples in medicine.
- Chemistry of carbohydrates: monosaccharides, disaccharides, polysaccharides, homoglycans and heteroglycans.
- Chemistry of lipids and steroids.
- Amino acids.
- Nucleotides in nucleonic acids.
- Vitamines.
- Molecular modeling of medically important molecules and medicines

Temeljni literatura in viri / Readings:

- F. Lazarini, J. Brenčič: Splošna in anorganska kemija, 3. izd., 1. natis, Fakulteta za kemijo in kemijsko tehnologijo, Ljubljana, , 2011.
- A. L. Lehninger, D. L. Nelson, M. M. Cox,: Principles of biochemistry 5 th ed., 3rd printing, Worth, New York, 2008.
- D. D. Ebbing, S. D. Gammon: General chemistry, 9th ed., Houghton Mifflin, cop., Boston, New York, 2009.
- J. B. Umland, J. M. Bellama: General chemistry, 3rd ed., Brooks/Cole Publishing Company ITP, Pacific Grove, 1999.
- H. R. Hunt, T. F. Block, G. M. McKelvy: Laboratory experiments for general chemistry, 4th ed., Brooks/Cole-Thomson Learning, Australia, United States, 2002.
- S. H. Strauss: Guide to solutions for Inorganic chemistry, 3rd ed. University Press, Oxford, 1999.
- Trevor Palmer, Philip L.R. Bonner, Enzymes: Biochemistry, Biotechnology, Clinical Chemistry, 2007 by Woodhead Publishing (first published January 1st 2001).
- A. Zeeck, S. C. Fischer, S. Grond, I. Papastavrou: Chemie für Mediziner, 5. völlig überarbeitete Auflage, Urban & Fischer Verlag, München, 2003

Cilji in kompetence:

Cilj tega predmeta je obnoviti osnovna znanja iz splošne kemije in poznavanja kemijske zgradbe molekul in reakcij, ter razumeti kemijske reakcije in procese v človeškem organizmu.

Objectives and competences:

The objective of this course is to renew the basic knowledge of general chemistry and knowledge of the chemical structure of molecules and reactions, and to understand the chemical reactions and processes in human body.

Predvideni študijski rezultati:

Znanje in razumevanje:

Po zaključku tega predmeta bo študent sposoben:

- prepoznati in razlikovati molekule,
- razumeti kemijske reakcije, ki potekajo v človeškem organizmu,
- razložiti transportne pojave v človeškem organizmu.

Prenesljive/ključne spretnosti in drugi atributi:

- delo v skupini,
- spretnost računanja.

Intended learning outcomes:

Knowledge and Understanding:

On completion of this course the student will be able:

- to recognize and differentiate molecules,
- to understand the chemical reactions in human body,
- to explain transport phenomenon in human body

Transferable/Key Skills and other attributes:

- team work,
- computation skill.

Metode poučevanja in učenja:

- predavanja,
- laboratorijske vaje.

Learning and teaching methods:

- lectures,
- lab work.

Načini ocenjevanja:

Delež (v %) /

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt) • pisni izpit • ustni izpit • opravljene laboratorijske vaje ŠTUDIJSKE OBVEZNOSTI ŠTUDENTOV opravljene laboratorijske vaje, ustni in pisni izpit POGOJI ZA PRISTOP K POSAMEZNEMU PREVERJANJU ZNANJA Uspešno opravljen praktični del laboratorijskih vaj je pogoj za pristop na kolokvij, ki je pogoj za pristop na pisni izpit. Kolokvij iz laboratorijskih vaj je pisno preverjanje opravljenih laboratorijskih vaj. Ocena vaj pa je sestavljena iz sodelovanja na vajah, kar je ovrednoteno z 20% ocene, ostalih 80% predstavlja kolokvij iz vaj. Pozitivno opravljen pisni del izpita je pogoj za opravljanje ustnega dela izpita. Izpit je pisni in ustni in je sestavljen iz nalog iz vseh področij. Tudi ustni del izpita se opravlja praviloma pisno. Ocena izpita je sestavljena iz ocen posameznih področij pisnega izpita in posameznih področij ustnega izpita.	60 % 30 % 10 %	Type (examination, oral, coursework, project): • written examination • oral examination • completed lab work ACADEMIC OBLIGATIONS OF STUDENTS: completed laboratory work, oral and written exam REQUIREMENTS FOR ACCESS TO INDIVIDUAL KNOWLEDGE CHECKING: Successfully completed practical part of laboratory work is a requirement for access to the partial exam which is a requirement for access to the written exam. Partial exam in laboratory work is written checking of completed laboratory work. Assessment of laboratory work consists of cooperation during laboratory work which is evaluated with 20% of the mark and the rest 80% of the mark is represented by the partial exam in laboratory work. Successfully completed written part of the exam is a requirement for taking the oral part of the exam. The exam is written and oral and consists of tasks from all areas. Also the oral part of the exam is regularly performed in a written form. The exam mark consists of marks of individual areas of the written exam and of individual areas of the oral exam.
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Reference nosilca / Lecturer's references:

MIRKOVIĆ, Dušica, IBRIĆ, Svetlana, BALANČ, Bojana D., KNEZ, Željko, BUGARSKI, Branko M. Evaluation of the impact of critical quality attributes and critical process parameters on quality and stability of parenteral nutrition nanoemulsions. *Journal of drug delivery science and technology*, ISSN 1773-2247, 2017, vol. 39, str. 341-347, ilustr., doi: 10.1016/j.jddst.2017.04.004. [COBISS.SI-ID 20561430], [JCR, SNIP, WoS do 14. 7. 2017: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, Scopus do 12. 6. 2017: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0]

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KNEZ HRNČIČ, Maša, KRAVANJA, Gregor, KNEZ, Željko. Hydrothermal treatment of biomass for energy and chemicals. *Energy*, ISSN 0360-5442. [Print ed.], Dec. 2016, vol. 116, part 2, str. 1312-1322, doi: 10.1016/j.energy.2016.06.148. [COBISS.SI-ID 19682838], [JCR, SNIP, WoS do 24. 9. 2017: št. citatov (TC): 4, čistih citatov (CI): 3, čistih citatov na avtorja (CIAu): 1.00, Scopus do 31. 8. 2017: št. citatov (TC): 5, čistih citatov (CI): 4, čistih citatov na avtorja (CIAu): 1.33]

ČOLNIK, Maja, PRIMOŽIČ, Mateja, KNEZ, Željko, LEITGEB, Maja. Use of non-conventional cell disruption method for extraction of proteins from black yeasts. *Frontiers in bioengineering and biotechnology*, ISSN 2296-4185, April 2016, vol. 4, str. 1-12, doi: 10.3389/fbioe.2016.00033. [COBISS.SI-ID 19560726], [SNIP]

KRAVANJA, Gregor, KNEZ HRNČIČ, Maša, ŠKERGET, Mojca, KNEZ, Željko. Interfacial tension and gas solubility of molten polymer polyethyleneglycol in contact with supercritical carbon dioxide and argon. *The Journal of supercritical fluids*, ISSN 0896-8446. [Print ed.], Feb. 2016, vol. 108, str. 45-55, doi: 10.1016/j.supflu.2015.10.013. [COBISS.SI-ID

19233814], [JCR, SNIP, WoS do 24. 9. 2017: št. citatov (TC): 4, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0.50, Scopus do 31. 8. 2017: št. citatov (TC): 4, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0.50]

BRGLEZ MOJZER, Eva, KNEZ HRNČIČ, Maša, ŠKERGET, Mojca, KNEZ, Željko, BREN, Urban. Polyphenols : extraction methods, antioxidative action, bioavailability and anticarcinogenic effects. *Molecules*, ISSN 1420-3049, 2016, vol. 21, no. 7, str. 1-38. <http://www.mdpi.com/1420-3049/21/7/901>, doi: 10.3390/molecules21070901. [COBISS.SI-ID 19672598], [JCR, SNIP, WoS do 24. 9. 2017: št. citatov (TC): 8, čistih citatov (CI): 8, čistih citatov na avtorja (CIAu): 1.60, Scopus do 30. 9. 2017: št. citatov (TC): 16, čistih citatov (CI): 16, čistih citatov na avtorja (CIAu): 3.20]