

UNIVERSITY OF ZAGREB  
 FACULTY OF VETERINARY MEDICINE  
 Heinzelova 55  
 Tel. 01/2390302  
 Division: Basic and Pre-clinical Sciences Division  
 Department / Clinic: Department of chemistry and biochemistry  
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 Register no.:  
 File no.:  
 Zagreb, n13.07.2020.



110173	REPUBLIKA HRVATSKA	
Veterinarski fakultet u Zagrebu		
Primljeno:	29.09.2020	
Klasifikacijska oznaka	Org. jed.	
605-03/20-04/25	251-61-02;251-61-32;	
Uredžbeni broj	Prilozi	Vrijednost
251-61-04-20-42	0	-

## COURSE SYLLABUS

Course name: Medical chemistry

Academic year 2020-2021

Course leader: assistant professor Luka Krstulović

Teachers: assistant professor Kristina Starčević

Associate teachers:

First day of classes: 29.09.2020.

Last day of classes: 26.11.2020.

Timetable for LECTURES academic year 2020-2021

LECTURES				
Date	Methodological unit	Teacher	Location / time	Literature
29.09.2020.	Introduction: Role of the chemistry and biochemistry in veterinary medicine Structure of substance: atoms, molecules, electronegativity, ionic and covalent bond	Asst. prof. Luka Krstulović	Lecture room of Department of Chemistry and Biochemistry 8-10h	A. Bettelheim, W. H. Brown, J. March (2004): Introduction to General, Organic and Biochemistry, Thomson M. M. Bloomfield (1992): Chemistry and the Living Organism, John Wiley & Sons, Inc. 3. M. S. Silberberg (2000): Chemistry, The Molecular Nature of Matter and Change, McGraw Hill
1.10.2020.	Dispersed systems I: suspensions, colloids, solutions, aqueous solutions, hydrogen bonds, electrolytes diffusion, osmose, colligative properties	Asst. prof. Luka Krstulović	Lecture room of Department of Chemistry and Biochemistry 16-18h	A. Bettelheim, W. H. Brown, J. March (2004): Introduction to General, Organic and Biochemistry, Thomson M. M. Bloomfield (1992): Chemistry and the Living Organism, John Wiley & Sons, Inc. 3. M. S. Silberberg (2000): Chemistry, The Molecular Nature of Matter and Change, McGraw Hill
6.10.2020.	Acids and bases: pH, buffers, biological buffers Reaction energy: Activation energy, endothermic and exothermic reactions, catalysts, biocatalysts)	Asst. prof. Luka Krstulović	Lecture room of Department of Chemistry and Biochemistry 10-12h	A. Bettelheim, W. H. Brown, J. March (2004): Introduction to General, Organic and Biochemistry, Thomson M. M. Bloomfield (1992): Chemistry and the Living Organism, John Wiley & Sons, Inc. 3. M. S. Silberberg (2000): Chemistry, The Molecular Nature of Matter and Change, McGraw Hill

15.10.2020.	Alkanes, alkenes, alkynes, Isomers and Isomerism: Structural isomerism and Stereoisomerism	Asst. prof. Luka Krstulović	Lecture room of Department of Chemistry and Biochemistry 14-16h	A. Bettelheim, W. H. Brown, J. March (2004): Introduction to General, Organic and Biochemistry, Thomson M. M. Bloomfield (1992): Chemistry and the Living Organism, John Wiley & Sons, Inc. 3. M. S. Silberberg (2000): Chemistry, The Molecular Nature of Matter and Change, McGraw Hill
21.10.2020.	<i>Organic compounds with oxygen:</i> alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids and their derivatives	Asst. prof. Luka Krstulović	Lecture room of Department of Chemistry and Biochemistry 8-10h	A. Bettelheim, W. H. Brown, J. March (2004): Introduction to General, Organic and Biochemistry, Thomson M. M. Bloomfield (1992): Chemistry and the Living Organism, John Wiley & Sons, Inc. 3. M. S. Silberberg (2000): Chemistry, The Molecular Nature of Matter and Change, McGraw Hill
23.10.2020.	<i>Organic compounds with nitrogen:</i> amines, heterocyclic compounds, alkaloids	Asst. prof. Luka Krstulović	Lecture room of Department of Physiology and Radiobiology 15-17h	A. Bettelheim, W. H. Brown, J. March (2004): Introduction to General, Organic and Biochemistry, Thomson M. M. Bloomfield (1992): Chemistry and the Living Organism, John Wiley & Sons, Inc. 3. M. S. Silberberg (2000): Chemistry, The Molecular Nature of Matter and Change, McGraw Hill
27.10.2020.	<i>Carbohydrates:</i> classification and stereoisomers, monosaccharides, disaccharides, polysaccharides	Asst. prof. Luka Krstulović	Lecture room of Department of Chemistry and Biochemistry	A. Bettelheim, W. H. Brown, J. March (2004): Introduction to General, Organic and Biochemistry, Thomson M. M. Bloomfield (1992): Chemistry

			8-10h	and the Living Organism, John Wiley & Sons, Inc. 3. M. S. Silberberg (2000): Chemistry, The Molecular Nature of Matter and Change, McGraw Hill
5.11.2020.	<i>Lipids</i> : structure, classification <i>Amino acids</i> : structures and properties	Asst. prof. Kristina Starčević	Lecture room of Department of Chemistry and Biochemistry 14-16h	A. Bettelheim, W. H. Brown, J. March (2004): Introduction to General, Organic and Biochemistry, Thomson M. M. Bloomfield (1992): Chemistry and the Living Organism, John Wiley & Sons, Inc. 3. M. S. Silberberg (2000): Chemistry, The Molecular Nature of Matter and Change, McGraw Hill
17.11.2020.	<i>Proteins</i> : Protein structure, enzymes, coenzymes <i>Nucleic acids</i> : Purine and pyrimidine bases, nucleosides, nucleotides	Asst. prof. Kristina Starčević	Lecture room of Department of Chemistry and Biochemistry 12-14h	A. Bettelheim, W. H. Brown, J. March (2004): Introduction to General, Organic and Biochemistry, Thomson M. M. Bloomfield (1992): Chemistry and the Living Organism, John Wiley & Sons, Inc. 3. M. S. Silberberg (2000): Chemistry, The Molecular Nature of Matter and Change, McGraw Hill

### Timetable for PRACTICALS academic year 2020-2021

PRACTICALS						
Date	Methodological unit	Teacher	Type of practical	Group	Location / time	Literature
02.10.2020.	Chemical	Asst. prof. Luka	Exercises in lecture	1,2	Lecture room of	Stolić, I: Chemical

	calculations- Basis of chemical calculations	Krstulović, Asst prof. Kristina Starčević	room		Department of Chemistry and Biochemistry 8-10h	calculations I, page 5-13
05.10.2020.	Chemical calculations- Composition of solutions I	Asst. prof. Luka Krstulović Asst. prof. Kristina Starčević	Exercises in lecture room	1,2	Lecture room of Department of Physiology and Radiobiology 12-14h	Stolić, I: Chemical calculations I, page 3-23
08.10.2020.	Qualitative chemical analysis- Detection of cations and anions	Asst. prof. Luka Krstulović Asst. prof. Kristina Starčević	Laboratory exercises	1,2	Laboratory of Department of Chemistry and Biochemistry 14-17h	Laboratory exercise in medicinal chemistry, page: 3-8, 16-23.
09.10.2020.	Chemical calculations- Composition of solutions II	Asst. prof. Luka Krstulović Asst. prof. Kristina Starčević	Exercises in lecture room	1,2	Lecture room of Department of Chemistry and Biochemistry 10-12h	Stolić, I: Chemical calculations I, page 14-23
14.10.2020.	Chemical calculations- Reaction of neutralisation	Asst. prof. Luka Krstulović Asst. prof. Kristina Starčević	Exercises in lecture room	1,2	Lecture room of Department of Pharmacology and toxicology 8-10h	Stolić, I: Chemical calculations I, page 24-28
20.10.2020.	Solution preparation and optical methods	Asst. prof. Luka Krstulović Asst. prof. Kristina Starčević	Laboratory exercises	1,2	Laboratory of Department of Chemistry and Biochemistry 14-17h	Laboratory exercise in medicinal chemistry, page: 11-13, 26-28
26.10.2020.	Chemical calculations- Dissociation, pH, buffer I	Asst. prof. Luka Krstulović Asst. prof. Kristina Starčević	Exercises in lecture room	1,2	Lecture room of Department of Chemistry and Biochemistry 10-12h	Krstulović, L: Chemical calculations II, page 17-22

28.10.2020.	Chemical calculations- Dissociation, pH, buffer II	Asst. prof. Luka Krstulović Asst. prof. Kristina Starčević	Exercises in lecture room	1,2	Lecture room of Department of Physiology and Radiobiology 12-14h	Krstulović, L: Chemical calculations II, page 17-22
03.11.2019.	Qualitative chemical analysis – Acidimetry	Asst. prof. Luka Krstulović Asst. prof. Kristina Starčević	Laboratory exercises	1,2	Laboratory of Department of Chemistry and Biochemistry 14-17h	Laboratory exercise in medicinal chemistry, page: 9-10, 29-30
6.11.2020.	Experimental determination of pH	Asst. prof. Luka Krstulović Asst. prof. Kristina Starčević	Laboratory exercises	1,2	Laboratory of Department of Chemistry and Biochemistry 11-14h	Laboratory exercise in medicinal chemistry, page: 14-15, 33-34
9.11.2020.	Chemical calculations- Redox reactions I	Asst. prof. Luka Krstulović Asst. prof. Kristina Starčević	Exercises in lecture room	1,2	Lecture Room Department of Chemistry and Biochemistry 16-18h	Krstulović, L: Chemical calculations II, page 4-11
20.11.2019.	Qualitative and quantitative chemical analysis – Detection of organic compounds	Asst. prof. Luka Krstulović Asst. prof. Kristina Starčević	Laboratory exercises	1,2	Laboratory of Department of Chemistry and Biochemistry 12-15h	Laboratory exercise in medicinal chemistry, page: 8-9, 11-13, 42-49.
23.11.2020.	Chemical calculations- Redox reactions II	Asst. prof. Luka Krstulović Asst. prof. Kristina Starčević	Exercises in lecture room	1,2	Lecture room of Department of Chemistry and Biochemistry 13-15h	Krstulović, L: Chemical calculations II, page 4-11
24.11.2020.	Chemical calculations- Colligative properties	Asst. prof. Luka Krstulović Asst. prof. Kristina Starčević	Exercises in lecture room	1,2	Lecture room of Department of Chemistry and Biochemistry	Krstulović, L: Chemical calculations II, page 11-16

					12-14h	
26.11.2020.	Qualitative chemical analysis – Iodometry	Asst. prof. Luka Krstulović Asst. prof. Kristina Starčević	Laboratory exercises	1,2	Laboratory of Department of Chemistry and Biochemistry 16-19h	Laboratory exercise in medicinal chemistry, page: 9-10, 38-39.

### STUDENT OBLIGATIONS

Lecture attendance	There are 18 lecture lessons. A student must attend 1 lesson to gain 0.33 point. The maximum number of points is 6 (18 lessons) and the minimum number of points is 3 (9 lessons).
Practicals attendance	There are 18 exercise lessons in the lecture-room (9 programmes). Each programme (two exercise lessons), is worth 0.66 points. Maximum number of points: 6 (18 lessons – 9 programmes). Minimum number of points: 4 (12 hours – 6 programmes)  There are 12 exercise lessons in the laboratory (6 programmes). A student must attend 2 lessons (1 programme) to gain 1 point. Maximum number of points: 6 (6 programmes), minimal number of points: 4 (4 programmes)
Active participation in seminars and practicals	Laboratory exercises: a student must solve a task from an exercise (programme) and present a report in order to get a signature for the exercise. Each correctly done and signed exercise is worth 1.67 points. The maximum number of points is 10 (6 programmes – coefficient 1.67), correspondingly: 8 points for 5 programmes, 7 points for 4 programmes and the minimum number of 5 points for 3 programmes.
Continuous knowledge-checking	Exercise in the lecture room: there will be 2 preliminary exams organized during the lessons. Each preliminary exam is worth 8 points. The maximum number of points: 16 (2 preliminary exams) The minimum number of points: 10. For students who do not gain the minimum number of points a retake exam will be organized.  A preliminary exam from attended lectures will be organized during the sessions. The exam consists of 8 questions and each correct answer is worth 2 points. A student can gain maximum of 16 points (8 correct answers), and she/he must gain a minimum 10 points (5 correct answers). A student who does not gain the minimal 10 points can retake a preliminary exam.

Final exam	In order to take the final exam a student must gain the minimum number of points from each evaluation element, i.e. the total of minimal 36 points from the first four evaluation elements. The final exam is in written form and it consists of 20 questions. Each correct answer is worth 2 points. A student can gain 40 points max. (20 correct answers). The minimal number of points a student must gain at the final exam is 24 (12 correct answers).
Examination requirements	Student requirements are defined in the Regulations on the Integrated Undergraduate and Graduate Study of Veterinary Medicine. Given the above, the student must acquire a minimum number of points from all assessment elements in order to take the final exam. <b>Article 45:</b> a student can justifiably be absent from up to 50 % of the lectures; 30% of the seminars and 30 % of the exercises.

### GRADING AND EVALUATING STUDENT WORK

Continuous knowledge-checking (mid-terms)	Preliminary exam, 19.10.2020.	
Final exams (dates)	16.12.2020.; 26.1.2021.; 9.2.2021.	
Form of final exam	Written form	

### LITERATURE

Obligatory literature	F. A. Bettelheim, W. H. Brown, J. March (2004): Introduction to General, Organic, and Biochemistry, Thomson. M. M. Bloomfield (1992): Chemistry and the Living Organism, John Wiley & Sons, Inc. M. S. Silberberg (2000): Chemistry, The Molecular Nature of Matter and Change, McGraw Hill. I. Stolić, I. (2013): Chemical calculation I, Veterinary faculty, Zagreb L. Krstulović, (2013): Chemical calculation II, Veterinary faculty, Zagreb L. Krstulović and K. Starčević (2020) Laboratory exercises in medical chemistry	
Optional literature	F. A. Carey (2003): Organic chemistry, McGrawHill, New York J. G. Smith (2006): Organic chemistry, McGrawHill, New York	



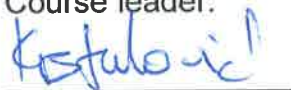
**OBJECTIVES AND LEARNING OUTCOMES**

Course objectives	The objective of this course is that students acquire knowledge of: matter structure, basic inorganic chemical reactions, structures and reactions of organic compounds, main groups of natural compounds and practical knowledge of chemical calculation, qualitative and quantitative analysis. Knowledge acquired by the following syllabus is going to be a base for attending and understanding of courses during the Veterinary medicine studies.	
Learning outcomes	Learning outcomes at the level of the course: After successful completion of the course the student will be able to: <ol style="list-style-type: none"><li>1. apply basic chemical reactions and physicochemical processes;</li><li>2. compare the structure and properties of simple organic compounds and complex biologically important molecules;</li><li>3. link the relationship of chemical structure of a molecule and its physical and chemical properties;</li><li>4. independently use basic methods of analytic chemistry for quantitative and qualitative analysis;</li><li>5. apply chemical calculations to solve the tasks.</li></ol>	

**GRADING SCHEME**

<i>Points</i>	<i>Grade</i>
Up to 59	1 (F)
60-68	2 (E)
69-76	2 (D)
77-84	3 (C)
85-92	4 (B)
93-100	5 (A)

Course leader:



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Head of Department/Clinic:



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Note: The course leader is required to submit a Course Syllabus to all teachers and associates pertaining to the Course.