Course: Biochemistry in Veterinary Medicine

UNIVERSITY OF ZAGREB
FACULTY OF VETERINARY MEDICINE
Heinzelova 55
Tel. 01/2390301
Division: Basic and Pre-Clinical Sciences
Organizational unit: Chemistry and Biochemistry
E-mail of the course leader: rrafaj@vef.hr
Register No of the organisational unit:
Zagreb, 09/02/2023

COURSE SYLLABUS

Course name: Biochemistry in Veterinary Medicine

Academic year 2022/2023

Course leader: Full Prof Renata Barić Rafaj
Deputy course leader: Assist. Prof Luka Krstulović

Teachers: Full Prof Renata Barić Rafaj
Postdotctoral assistant Josipa Kuleš

First day of classes: 27/02/2023
Last day of classes: 01/06/2023

Timetable for LECTURES academic year 2022/2023

LECTURES				
Date	**Methodological unit**	**Teacher**	**Location / Time**	**Literature**
27/02/2023. 1st lecture	**L1** Aminoacids	Prof. dr. sc. Barić Rafaj	Lecture hall of Chemistry and Biochemistry, 08am-10am	BERG J. M., J. L. TYMOCZKO, L. STRYER (2014): Biochemistry, 7. Ed. Školska knjiga, Zagreb
08/03/2023. 2nd lecture	**L2** Proteins	Prof. dr. sc. Barić Rafaj	Lecture hall of Chemistry and Biochemistry, 08am-10am	BERG J. M., J. L. TYMOCZKO, L. STRYER (2014): Biochemistry, 7. Ed. Školska knjiga, Zagreb
16/03/2023. 3rd lecture	**L3** Enzymes	Prof. dr. sc. Barić Rafaj	Lecture hall of Chemistry and Biochemistry, 08am-10am	BERG J. M., J. L. TYMOCZKO, L. STRYER (2014): Biochemistry, 7. Ed. Školska knjiga, Zagreb
21/03/2023. 4th lecture	**L4** Hemoglobin	Prof. dr. sc. Barić Rafaj	Lecture hall of Chemistry and Biochemistry, 12pm-14pm	BERG J. M., J. L. TYMOCZKO, L. STRYER (2014): Biochemistry, 7. Ed. Školska knjiga, Zagreb
30/03/2023. 5th lecture	**L5** Signals	Prof. dr. sc. Barić Rafaj	Lecture hall of Chemistry and Biochemistry, 11am-14pm	BERG J. M., J. L. TYMOCZKO, L. STRYER (2014): Biochemistry, 7. Ed. Školska knjiga, Zagreb
31/03/2023. 6th lecture	**L6** ATP	Prof. dr. sc. Barić Rafaj	Lecture hall of Chemistry and Biochemistry, 08am-10am	BERG J. M., J. L. TYMOCZKO, L. STRYER (2014): Biochemistry, 7. Ed. Školska knjiga, Zagreb
03/04/2023 7th lecture	**L7** Glycolysis	Prof. dr. sc. Barić Rafaj	Lecture hall of Chemistry and Biochemistry, 14pm-16pm	BERG J. M., J. L. TYMOCZKO, L. STRYER (2014): Biochemistry, 7. Ed. Školska knjiga, Zagreb
13/04/2023. 8st lecture	**L8** Citric acid cycle	Prof. dr. sc. Barić Rafaj	Lecture hall of Chemistry and Biochemistry, 08am-10am	BERG J. M., J. L. TYMOCZKO, L. STRYER (2014): Biochemistry, 7. Ed. Školska knjiga, Zagreb
18/04/2023. 9th lecture	**L9** Oxidative phosphorylation	Prof. dr. sc. Barić Rafaj	Lecture hall of Chemistry and Biochemistry, 14pm-17pm	BERG J. M., J. L. TYMOCZKO, L. STRYER (2014): Biochemistry, 7. Ed. Školska knjiga, Zagreb
24/04/2023. 10th lecture	**L10** Glycogen	Prof. dr. sc. Barić Rafaj	Lecture hall of Chemistry and Biochemistry, 08am-10am	BERG J. M., J. L. TYMOCZKO, L. STRYER (2014): Biochemistry, 7. Ed. Školska knjiga, Zagreb

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26/04/ 2023. 11th lecture	**L11** Lipids	Prof. dr. sc. Barić Rafaj	Lecture hall of Chemistry and Biochemistry, 12pm-14pm	BERG J. M., J. L. TYMOCZKO, L. STRYER (2014): Biochemistry, 7. Ed. Školska knjiga, Zagreb
05/05/2023. 12th lecture	**L12** Ketones	Prof. dr. sc. Barić Rafaj	Lecture hall of Chemistry and Biochemistry, 12.30pm-14pm	BERG J. M., J. L. TYMOCZKO, L. STRYER (2014): Biochemistry, 7. Ed. Školska knjiga, Zagreb
15/05/2023. 13th lecture	**L13** Urea cycle	Prof. dr. sc. Barić Rafaj	Lecture hall of Chemistry and Biochemistry, 10am-12am	BERG J. M., J. L. TYMOCZKO, L. STRYER (2014): Biochemistry, 7. Ed. Školska knjiga, Zagreb
26/05/2023. 14th lecture	**L14** Integration	Prof. dr. sc. Barić Rafaj	Lecture hall of Chemistry and Biochemistry, 7.30am-10am	BERG J. M., J. L. TYMOCZKO, L. STRYER (2014): Biochemistry, 7. Ed. Školska knjiga, Zagreb

Timetable for SEMINARS academic year 2022/2023

SEMINARS					
Date	**Methodological unit**	**Teacher**	**Group**	**Location / time**	**Literature**
28/02/2023. 1st seminar	**S1** PTM	Prof. dr. sc. Barić Rafaj	1,2,3	Lecture hall of Chemistry and Biochemistry, 12pm-13pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Seminars – script, Faculty of Veterinary Medicine, Zagreb
09/03/2023. 2nd seminar	**S2** Proteins	Prof. dr. sc. Barić Rafaj	1,2,3	Lecture hall of Chemistry and Biochemistry, 12pm-13pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Seminars – script, Faculty of Veterinary Medicine, Zagreb
17/03/2023 3rd seminar	**S3** Enzymes	Prof. dr. sc. Barić Rafaj	1,2,3	Lecture hall of Chemistry and Biochemistry, 09am-10am	BARIĆ RAFAJ R., J. KULEŠ (2010): Seminars – script, Faculty of Veterinary Medicine, Zagreb
29/03/2023. 4th seminar	**S4** Hemoglobine	Prof. dr. sc. Barić Rafaj	1,2,3	Lecture hall of Chemistry and Biochemistry, 09am-10am	BARIĆ RAFAJ R., J. KULEŠ (2010): Seminars – script, Faculty of Veterinary Medicine, Zagreb
04/04/2023 5th seminar	**S5** Lactate	Prof. dr. sc. Barić Rafaj	1,2,3	Lecture hall of Chemistry and Biochemistry, 15pm-16pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Seminars – script, Faculty of Veterinary Medicine, Zagreb
20/04/2023 6th seminar.	**S6** Inhibitors of ETC	Prof. dr. sc. Barić Rafaj	1,2,3	Lecture hall of Chemistry and Biochemistry, 14pm-15pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Seminars – script, Faculty of Veterinary Medicine, Zagreb
25/04/2023	**S7** Glutathione	Prof. dr. sc. Barić Rafaj	1,2,3	Lecture hall of Chemistry and Biochemistry,	BARIĆ RAFAJ R., J. KULEŠ (2010): Seminars –

7th seminar				13pm-14pm	script, Faculty of Veterinary Medicine, Zagreb
27/04/2023. 8th seminar	**S8** cAMP	Prof. dr. sc. Barić Rafaj	1,2,3	Lecture hall of Chemistry and Biochemistry, 14pm-15pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Seminars – script, Faculty of Veterinary Medicine, Zagreb
11/05/2023. 9th seminar	**S9** Ketones	Prof. dr. sc. Barić Rafaj	1,2,3	Lecture hall of Chemistry and Biochemistry, 13pm-14pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Seminars – script, Faculty of Veterinary Medicine, Zagreb
15/05/2023. 10th seminar	**S10** Derivates of AA	Prof. dr. sc. Barić Rafaj	1,2,3	Lecture hall of Chemistry and Biochemistry, 12pm-13pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Seminars – script, Faculty of Veterinary Medicine, Zagreb
17/05/2023. 11th seminar	**S11** Vitamins	Prof. dr. sc. Barić Rafaj	1,2,3	Lecture hall of Chemistry and Biochemistry, 13pm-14pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Seminars – script, Faculty of Veterinary Medicine, Zagreb
31/05/2023. 12th seminar	**S12** Organs	Prof. dr. sc. Barić Rafaj	1,2,3	Lecture hall of Chemistry and Biochemistry, 09am-10am	BARIĆ RAFAJ R., J. KULEŠ (2010): Seminars – script, Faculty of Veterinary Medicine, Zagreb

Timetable for PRACTICALS academic year 2022/2023

PRACTICALS						
Date	**Methodological unit**	**Teacher**	**Type of practical** (Article 31. of Regulation)	**Group**	**Location / time**	**Literature**
06/03/2023 1st practical	**P1** Separation	Josipa Kuleš, PhD	laboratory	3	Laboratory of Chemistry and Biochemistry, 12pm-14.30pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb
06/03/2023 1st practical	**P1** Separation	Prof. dr. sc. Barić Rafaj Jospia Kuleš, PhD	laboratory	1,2	Laboratory of Chemistry and Biochemistry, 14.30pm-17pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb
14/03/2023 2nd practical	**P2** Proteins	Prof. dr. sc. Barić Rafaj Josipa Kuleš, PhD	laboratory	1,2	Laboratory of Chemistry and Biochemistry, 7.30am-10am	BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb
15/03/2023 2nd practical	**P2** Proteins	Jospia Kuleš, PhD	laboratory	3	Laboratory of Chemistry and Biochemistry, 10am-12.30pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb
20/03/2023 3rd practical	**P3** Enzymes	Josipa Kuleš, PhD	laboratory	3	Laboratory of Chemistry and Biochemistry, 10am-12.30pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb
21/03/2023 3rd practical	**P3** Enzymes	Prof. dr. sc. Barić Rafaj Josipa Kuleš, PhD	laboratory	1,2	Laboratory of Chemistry and Biochemistry, 09am-11am	BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb
22/03/2023 4thpractical	**P4** Hemoglobin	Prof. dr. sc. Barić Rafaj Josipa Kuleš, PhD Josipa Kuleš, PhD	laboratory laboratory	1,2 3	Laboratory of Chemistry and Biochemistry, 9.30am-12am Laboratory of Chemistry and Biochemistry, 14pm-16.30pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb

23/03/2023 3rd practical S	**P3S** Enzymes	Josipa Kuleš, PhD	simulation simulation simulation	1 3 2	Department of Animal Husbandry, 14pm-15pm Department of Animal Husbandry, 15pm-16pm Department of Animal Husbandry, 16pm-17pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb
11/04/2023 5th practical	**P5** Lactate **1st COLL**	Prof. dr. sc. Barić Rafaj Josipa Kuleš, PhD Josipa Kuleš, PhD	laboratory laboratory	1,2 3	Laboratory of Chemistry and Biochemistry, 11am-13.30pm Laboratory of Chemistry and Biochemistry, 13.30pm-16pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb
03/05/2023 6th practical	**P6** Glycogen	Prof. dr. sc. Barić Rafaj Josipa Kuleš, PhD	laboratory	1,2	Laboratory of Chemistry and Biochemistry, 12pm-14pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb
04/05/2023 6th practical	**P6** Glycogen	Josipa Kuleš, PhD	laboratory	3	Laboratory of Chemistry and Biochemistry, 10am-12am	BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb
10/05/2023 7th practical	**P7** Lipids **2nd COLL**	Prof. dr. sc. Barić Rafaj Josipa Kuleš, PhD	laboratory	1,2	Laboratory of Chemistry and Biochemistry, 12.30pm-15pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb
11/05/2023 7th practical	**P7** Lipids **2nd COLL**	Josipa Kuleš, PhD	laboratory	3	Laboratory of Chemistry and Biochemistry, 14pm-16.30pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb
18/05/2023 8th practical	**P8** Urea	Prof. dr. sc. Barić Rafaj Josipa Kuleš, PhD	laboratory	1,2	Laboratory of Chemistry and Biochemistry, 12pm-14.30pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb
19/05/2023 8th practical	**P8** Urea	Josipa Kuleš, PhD	laboratory	3	Laboratory of Chemistry and Biochemistry, 12.30pm-15pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb
24/05/2023 9th practical	**P9** Urine	Prof. dr. sc. Barić Rafaj Josipa Kuleš, PhD	laboratory	1,2	Laboratory of Chemistry and Biochemistry, 12.30pm-15pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb

25/05/2023 9th practical	**P9** Urine	Josipa Kuleš, PhD	laboratory	3	Laboratory of Chemistry and Biochemistry, 14pm-16.30pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb
01/06/2023 10th practical	**P10** Integration 3rd **COLL**	Prof. dr. sc. Barić Rafaj Josipa Kuleš, PhD Josipa Kuleš, PhD	laboratory laboratory	1,2 3	Laboratory of Chemistry and Biochemistry, 08am-10.30am Laboratory of Chemistry and Biochemistry, 11am-13.30pm	BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb

COLL* = Obligatory Colloquium

STUDENT OBLIGATIONS

Lecture attendance	Teaching takes place during 14 lectures. The attendance at each lecture is scored at 0.43 points (maximum 0.43x14 = 6 points, minimum 3).
Seminars attendance	12 seminars: the maximum number of points to be collected is 6 (0.5 x 12 seminars = 6 points maximum; 0.5 x 10 seminars = 5 points minimum.
Practicals attendance	Students perform a total of 10 lab practicals, and the presence is scored with 0.6 points (0.6 x 10 exercises = 6 points maximum, 0.6 points x 8 practicals = 5 points minimal).
Active participation in seminars and practicals	Practice exercises: a correctly performed exercise during 10 exercises is scored with 0.2 points, and the correct answers to 3 questions are scored with 0.3 points (0.5x10 exercises = 5 points maximum, minimum 2.5 points). Seminar activity is evaluated with correct answers to a few short questions during 4 seminars, a total of 1.25 points (1.25 x 4 = maximum 5 points, minimum 2.5 points).
Final exam	It consists of a written exam containing 20 questions. The maximum number of points that can be achieved on the final exam is 40 and a minimum is 24. To attend to the exam, students have to pass colloquium with minimal 20 points (sum of all 3 colloquiums)
Examination requirements	Student requirements are defined in the Regulations on the Integrated Undergraduate and Graduate Study of Veterinary Medicine (2022). Given the above, the student must acquire a minimum number of points from all assessment elements in order to take the final exam. **Article 41:** a student can justifiably be absent from up to 50 % of the lectures; 20% of the seminars and 20 % of the exercises.

GRADING AND EVALUATING STUDENT WORK

Continuous knowledge-checking (mid-terms)	1st C =11/04/2023 group 1,2,3; 2nd C=10/05/2023 group 1,2; 11/05/2023 group 3; 3rd C=01/06/2023 group 1,2,3
Final exams (dates)	19.06.2023., 28.06.2023., 07.07.2023., 11.09.2023., 21.09.2023.
Form of final exam	written

LITERATURE

Obligatory literature	BERG J. M., J. L. TYMOCZKO, L. STRYER (2014): Biochemistry, 7. Ed. Školska knjiga, Zagreb BARIĆ RAFAJ R., J. KULEŠ (2010): Seminars – script, Faculty of Veterinary Medicine, Zagreb BARIĆ RAFAJ R., J. KULEŠ (2010): Practicals – script, Faculty of Veterinary Medicine, Zagreb
Optional literature	DEVLIN, T. M. (2006): Textbook of Biochemistry with Clinical Correlations, A. J. Willey and sons, New York

OBJECTIVES AND LEARNING OUTCOMES

Course objectives	Adopting knowledge about the structure and function of the most important proteins, carbohydrates and fats in the body, understanding the course and the connection of the metabolic pathways and how to regulate them
Learning outcomes	After successfully passing the course student will be able to: 1. to define the structure of most proteins, carbohydrates and fats in the body, and the importance of certain types of chemical bonds in metabolic processes 2. to explain the correlation of structure and main function of most proteins, carbohydrates and fats 3. to show the sequence of biochemical changes in the major metabolic pathways, explain the effect of the major enzyme systems in catalysis of certain reactions 4. to analyse the ways of regulation of biological activity 5. to apply a simple biochemical methods for measuring analytes in biological samples 6. to understand the connection of metabolic pathways and accept the theoretical basis for the selection and evaluation to the results of varuous laboratory measurements 7. to understand changing of metabolic pathways using various treatment procedures

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GRADING SCHEME

Points	*Grade*
Up to 59	1 (F)
60-76	2 (D,E)
77-84	3 (C)
85-92	4 (B)
93-100	5 (A)

Course leader

Prof. dr. sc. Renata Barić Rafaj

Head of organizational unit:

Assist. Prof Luka Krstulović

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