

(Table 5.2) Course unit description

Study program: Chemistry
Type and level of studies: Master academic studies of Chemistry – module Research and Development
Course unit: Chemistry of antioxidants
Teacher in charge: Vladimir P. Petrović
Language of instruction: English
ECTS: 5
Prerequisites: Enrolled in the master academic studies in Chemistry
Semester: winter
Course unit objective To introduce students with the latest scientific knowledge about reactive oxygen and nitrogen species that are formed in the body, their physiological role and toxicity, the mechanisms of antioxidant protection of the body, natural compounds and synthetic supplements that can improve health status. Students will expand the knowledge acquired in basic studies of chemistry, i.e. biochemistry, and become familiar with direct and indirect methods of qualitative and quantitative determination of antioxidant activity of natural and synthetic compounds.
Learning outcomes of Course unit After mastering the material in this course, the student is expected to demonstrate and expand the knowledge acquired by attending this course, to show independence and creativity in the application of theoretical and practical knowledge in the field of antioxidant chemistry. He is expected to work competently in a modern laboratory dealing with this issue and to independently plan experiments and apply advanced methods, techniques and research procedures.
Course unit contents <i>Theoretical classes:</i> The phenomenon of oxygen toxicity in aerobic organisms. Formation and properties of toxic forms of oxygen and nitrogen in the cell and the concept of oxidative stress. Harmful effects of free radicals in the body and the development of diseases. Mechanisms of free radical toxicity: lipid peroxidation, oxidative damage to proteins, DNA and carbohydrates, mechanisms of action of pro-oxidative metals (iron, copper). Free radicals and aging. Enzymatic (superoxide dismutase, catalase, glutathione reductase and glutathione peroxidase) and non-enzymatic (L-ascorbic acid, α -tocopherol, carotenoids, ubiquinone, glutathione, uric acid, bilirubin and proteins that bind iron and copper ions) antioxidant protection of the body. Natural and synthetic antioxidants. Plants with antioxidant components. Polyphenolic compounds as antioxidants and their classification. Antioxidants as dietary supplements and additives. Food components with antioxidant and/or pro-oxidant role, bioactivation of antioxidants from food, mechanisms of action of antioxidants from food, carotenoids, vitamin E, vitamin C. Direct and indirect methods for determining the antioxidant activity of natural and synthetic compounds. Thermodynamic and kinetic approach to determining the potential antioxidant capacity and mechanism of action of some phenolic antioxidants (HAT, PCET and SPLET mechanisms). <i>Practical classes:</i> Practical teaching follows lectures and is carried out in the form of experimental exercises that will include various methods for determining the total antioxidant capacity of compounds and mixtures, detection of compounds responsible for antioxidant activity, determination of lipid peroxidation inhibition capacity (AAPH test) and lipoxigenase inhibition, determination of vitamin C.
Literature 1. B. V. Đorđević, D. D. Pavlović, M. G. Kostić: Biochemistry of Free Radicals, Faculty of Medicine, Niš, 2000. 2. Petrović Z. D., Simijonović D., Petrović V. P., Bioorganic Chemistry – Practical, 2015, Faculty of Science and Mathematics, University of Kragujevac, ISBN: 978-86-6009-031-9

3. B. Halliwell, J.M.C. Gutteridge: Free radicals in biology and medicine, Oxford University Press Inc., New York, 2007

4. F. Shahidi (ed): Natural Antioxidants: Chemistry, Health Effects, and Applications, AOCS Press, 1997

5. E. Cadenas, L. Packer (eds.): Handbook of Antioxidants, Marcel Dekker, Inc., New York, USA, 2002

Number of active teaching hours

Lectures: 2	Practice: 2	Other forms of classes:	Independent work:	Other classes:

Teaching methods

Lectures, seminars, practical classes

Examination methods (maximum 100 points)

Exam prerequisites	No. of points	Final exam	No. of points
Practical classes	5	Written examination	55
Tests		Oral examination	
Practical exercises	5	Colloquium(s)	30
Homework		Other	
Seminars	5		
Project			

Grading system

Grade	No. of points	Description
10	>= 91	Excellent
9	81-90	Exceptionally good
8	71-80	Very good
7	61-70	Good
6	51-60	Passing
5	<=50	Failing