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**MEDICAL UNIVERSITY**

**“PROF. DR. PARASKEV STOYANOV” - VARNA**

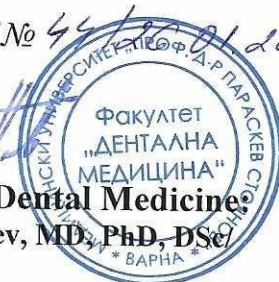
**FACULTY OF DENTAL MEDICINE**

*Approved with a Protocol of № 44/16.01.2022.*

**Approved:**

**DEAN of Faculty of Dental Medicine**

**/ Prof. Stefan Peev, MD, PhD, DSc**



**EDUCATIONAL PROGRAMME**

**OF**

**“ CHEMISTRY “**

**Specialty “DENTAL MEDICINE”**

**Educational-qualification degree “MASTER”**

**Professional qualification “ PHYSICIAN IN DENTAL MEDICINE”**

	Semester	Horarium weekly	Total horarium
Lectures	1	3	36
Exercises	1	2	24
Total		5	60
Monitoring and evaluation forms	Current control		Exam- I semester
Credits ( ECTS )			4
Extracurricular employment			60

Lecturers:

**Varna, 2022**

## ANNOTATION:

Chemistry is taught in the first year of academic study- winter and summer semester. Graduate in chemistry has knowledge that is necessary for understanding of chemical principles applied in further study subjects. General and inorganic chemistry provides students with understanding of solution properties, principles and techniques for qualitative, qualitative and instrumental analysis, acids, bases, buffer solutions and basic physico-chemical laws. Organic chemistry enables students to become familiar with compounds and reactions taking part in metabolism and with organic compounds that have importance in toxicology. Seminars are complementary to chemistry lecture. The knowledge of general, inorganic and organic chemistry is thoroughly practiced during chemistry seminars. This is accomplished through discussions on different topic, solving problems and naturally performing chemical experiments. Students have to evaluate and comment their results at the end of the class.

## PLAN OF TOPICS OF LECTURES

### PROGRAM FOR LECTURES

Number	Topic	Hours
1	<b>General and Inorganic Chemistry</b> Liquid systems. Solvent and solutions. Factors affecting solubility of solute. Solutions. Saturated, unsaturated and supersaturated. Concentration of solutions.	3
2	Acids and bases. Properties of acids and bases. Bronsted – Lowry Concept of Acid and Bases. Strengths of Acids and Bases. Acid Ionization Constant.	3
3	Self – ionization of water. pH scale. Methods of pH measurement. Hydrolysis of salts.	3
4	Buffer solutions. The Henderson-Hasselbach equation. Buffer's curve. Buffer's capacity. Physiological buffer systems.	3
5	Oxidation and reduction. Balancing of oxidation – reduction reactions. Electrode potentials. Standard hydrogen electrode. Importance of oxidation – reduction reactions.	3
6	<b>Organic Chemistry</b> Aldehydes and ketones. Structure of the carbonyl group. Physical properties. Oxidation and reduction, addition reactions.	3
7	Carboxylic acids. Nomenclature of carboxylic acids. Properties and reactions. Aromatic carboxylic acids. Applications and significance.	3
8	Lipids – classification, composition and structure. Types of lipids. Properties. Significance and uses. Phosphoglycerides and phospholipids.	3
9	Amino acids. Classification of amino acids. Essential amino acids. Acid-base properties of amino acids. Isoelectric point. Amino acids. Chemical properties. Peptides	3
10	Carbohydrates. Monosaccharides – glucose, fructose, ribose. Occurrence. Composition and structure. Physical properties. Disaccharides – sucrose, maltose, lactose. Occurrence. Composition and structure. Physical properties. Significance and uses.	3
11	Heterocyclic Compounds. Heterocyclic Bases. Heterocyclic compounds with 5 membered rings – representatives and derivatives.	3
12	Heterocyclic compounds with 6 membered rings – representatives and derivatives.	3

## LABORATORY EXERCISES

Note: Following Laboratory program covers **the full** Chemistry Course (24 acad. hours).

Number	Topic	Hours
1.	Initial instructions: Safety rules in chemical lab. Solutions and methods for describing their concentration. Mass fraction and mass percentage. Theoretical training: solving problems.	2
2.	Solutions and methods for describing their concentration. Molar concentration. Theoretical training: solving problems.	2
3.	Analytical chemistry. Analytical reactions for most important cations and anions.	2
4.	Self-ionization of water, ionic product of water, pH. Methods for calculation and measurement of pH. Buffer solutions and their properties. Henderson-Hasselbalch equation.	2
5.	TEST: concentration, pH, buffer solutions.	2
6.	Alcohols and phenols. Amines (aliphatic and aromatic). Amino alcohols.	2
7.	Aldehydes and ketones. Oxidation. Reactions of condensation and polymerization. Carboxylic acids. Saturated and unsaturated acids. Carboxylic acid derivatives: amides, esters, glycerophospholipids.	2
8.	Substituted carboxylic acids. Hydroxy acids: lactic, malic, tartaric, citric and salicylic acid. Amino acids: structure, stereoisomerism, properties. Buffer action. Titration curves.	2
9.	Heterocyclic compounds containing one N-atom: pyrrole, indole and pyridine groups.	2
10.	Heterocyclic compounds containing two or more N-atoms: pyrazole, imidazole, pyrimidine and purine groups.	2
11.	TEST: hydroxy acids, amino acids, heterocyclic compounds.	2
12.	Carbohydrates: structure. Monosaccharides: properties. Disaccharides: reducing and non-reducing. Polysaccharides: starch, glycogen and cellulose. Hydrolysis of carbohydrates.	2

Note: Duration of Lab classes is 2 academic hours weekly (2 x 45 min = 90 min).

## Examination Synopsis of Chemistry

1. Protolytic theory of acid and bases. Strong and weak acids. Neutralization.
2. Protolytic theory of acid and bases. Acid-base reactions *à la* Brønsted. The Hydronium ion. Acids and the hydrogen ion. Bases and the hydrogen ion.
3. Acid-base reactions *à la* Brønsted. Conjugate pairs.
4. Autoprotolysis. Ampholytes.
5. Lewis acids and bases. Protons and electron-pairs. Acid-base reactions without protons.
6. Dissociation of water. Ion product of water.
7. pH. pH scale. pH indicators. Titration.
8. Oxidation-reduction reaction. Oxidizing and reducing agents
9. Electron half- and full ionic equations. The reaction between hydrogen peroxide and manganate (VII) ions.
10. Buffer solution. An acidic buffer solution. An alkaline buffer solution.
11. How do buffer solutions work? Calculating the pH of buffer solutions Buffer capacity.
12. Alcohols. The different kinds of alcohols. The manufacture of alcohols.
13. The dehydration of alcohols. Reacting alcohols with sodium. Replacing the –OH group in alcohols by a halogen. Oxidation of alcohols.
14. Etherification of alcohols. Mechanism. Preparation of esters.
15. Aldehydes and ketones. Bonding and reactivity.
16. Aldehydes and ketones. Making aldehydes and ketones. Simple addition to aldehydes and ketone – the nucleophilic addition of hydrogen cyanide, sodium hydrogensulphite, ammonia, hydrazine, hydroxylamine and water.
17. Aldehydes and ketones. Reduction and oxidation of aldehydes and ketones.
18. Addition – elimination reaction of aldehydes and ketones.
19. Carboxylic acids. Making and acidity of the carboxylic acids. Differences in acid strengths between carboxylic acids, phenols and alcohols. Variations in acid strengths between different carboxylic acids.
20. Chemical reactions of the carboxylic acids. Etherification of carboxylic acids.
21. Reduction of carboxylic acids. Converting carboxylic acids into acyl chlorides. The decarboxylation of carboxylic acids and their salts.
22. Derivatives of carboxylic acids. Amides. Making and hydrolysis of amides. Chemical reaction of amides. Polyamides.
23. Derivatives of carboxylic acids. Acid anhydrides. Making and reaction of acid anhydrides with water, alcohols and phenol.
24. Derivatives of carboxylic acids. Nitriles. Making and hydrolysis of nitriles. Reducing nitriles to primary amines.
25. Derivatives of carboxylic acids. Esters. Fats and oils. Properties of simple esters, fats and oils. The mechanism for the etherification reactions. Hydrolyzing esters. Acid catalyzed hydrolysis of esters.
26. Lipids containing glycerol – triglycerides, glycerophospholipids (phospholipids). Polyesters.
27. Hydroxy carboxylic acids. Lactic acid. Lactic acid in foods.
28. Hydroxy carboxylic acids. Salicylic acids.
29. Hydroxy carboxylic acids. Citric acid
30. Hydroxy carboxylic acids. Fumaric and maleic acids.



31. Hydroxy carboxylic acids. Tartaric acid.
32. Important chemical reactions of the hydroxy carboxylic acids.
33. Amino acids. Amino acids classification according to R – group (biochemical). Optical activity of amino acids.
34. Amino acids as zwitterions. Adding an alkali to an amino acid solution. Adding an acid to an amino acid solution. Shifting the pH from one extreme to the other.
35. Isoelectric point. The titration curve. Peptides and polypeptides
36. Carbohydrates. Structure of monosaccharides. Aldoses. D-Glucose, D-galactose, D-mannose, D-ribose.
37. Carbohydrates. Structure of monosaccharides. Ketoses - D-fructose.
38. Structure of disaccharides. Maltose, cellobiose, lactose, sucrose.
39. Structure of polysaccharides. Cellulose, starch, glycogen.
40. Structure of polysaccharides. Sorbitol, glucosamine, pectin, glycosaminoglycans, heparin.
41. Important chemical reactions of monosaccharides.
42. Heterocyclic Compounds. Pyrrole. Porphin. Protoporphyrin. Hemoglobin.
43. Heterocyclic Compounds. Indole. Tryptophan. Tryptamine. Serotonin. Skatole.
44. Heterocyclic Compounds. Diazoles. Pyrazole. Antipyrine. Primidone. Analgin.
45. Heterocyclic Compounds. Pyridine. N-substitution. Pyridine carboxylic acids. Vitamin B<sub>6</sub>.
46. Heterocyclic Compounds. Purine. Uric acid, adenin, guanine, xantine
47. Heterocyclic Compounds. Pyrine alkaloids.

### Literature

1. Makedonski L., Peycheva K., Panayotova V. Laboratory Manual for general and Organic Chemistry Students of Medicine, Steno, Varna, 2018
2. Karen C. Timberlake, Chemistry- An introduction to General, Organic and biological Chemistry, Tenth Edition, Person education, Inc. New Jersey, 2009
3. Karen C. Timberlake, Laboratory manual for General, Organic and Biological Chemistry: Structure of Life, Person Education, Inc. New Jersey, 2007
4. John McMurry, Organic Chemistry, Sixth Edition, Thomson Learning, Inc. United States, 2004
5. Benjamin Abelow, Understanding Acid-Base, Williams & Wilkins, Maryland, 2007
6. General Chemistry, online  
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Department's council protocol № 120 form 11 January 2022

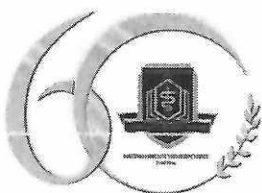
Prepared:



Prof. Lubomir Makedonski, PhD  
*Head of Department of Chemistry*



Chief Asst. Prof. Veselina Panayotova, PhD



## Препис-извлечение на

### ПРОТОКОЛ

№ 120/11.01.2022

/форма: присъствена/

Днес, 11.01.2022 се проведе катедрен съвет на Катедрата по "Химия" със следния дневен ред:

1. Обсъждане и приемане на актуализирани учебни програми за специалност Дентална Медицина АЕО и БЕО
2. Разни

На катедреният съвет присъстват: проф. Л. Македонски, доц. Д. Добрева, доц. Албена Мерджанова, доц. Ст. Георгиева, гл. ас. К. Пейчева, гл. ас. В. Панайотова, гл. ас. А. Герасимова, гл.ас. Л.Нанева

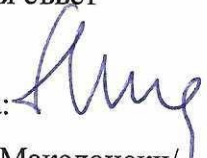
По т.1 от дневния ред проф. Л.Македонски информира, че след проведена консултация предлага да се приемат актуализираните учебни програми за специалност Дентална Медицина АЕО и БЕО


Предложението бе подложено на гласуване от академичния състав на катедрата.

Гласували: 8 души, от които: ЗА – 8 души; ПРОТИВ – 0 души; ВЪЗДЪРЖАЛИ СЕ – 0 души;

РЕШЕНИЕ: Предложението беше гласувано положително от Катедрения съвет

11.01.2022 г  
гр. Варна

Ръководител катедра:   
/проф. Л.Македонски/

Протоколчик:   
/гл. ас. К.Пейчева/