Subject:	**Chemistry of Dental Materials**	**Code:**	*ULCHBKB/CHDM-ZL/24*
Study Programme:	*Dental Medicine*	**Study Period:**	*1. semester*
Evaluation:	*exam*	**Subject Type:**	*compulsory*
Content:	*2 h lectures and 3 h practical exercises / week*		*total 70 hours*

Workplace: **Department of Medical and Clinical Biochemistry, UPJŠ in Košice, FM**

Week	***Lectures*** https://portal.lf.upjs.sk/index-en.php	***Practical Lessons*** https://portal.lf.upjs.sk/index-en.php
1.	**INTRODUCTION TO THE STUDY OF CHEMISTRY OF DENTAL MATERIALS** - Definition of basic terms - Chemical composition and classification of dental materials - Biocompatibility **DISPERSION SYSTEMS, WATER, SOLUTIONS** - Properties of dispersion systems - True and colloidal solutions, electrolytes - Diffusion and osmosis - Surface phenomena, adsorption	**Laboratory safety rules** **Principles of laboratory technique** - Equipment of laboratory bench - Volume measurement
2.	**LAWS OF CHEMICAL REACTIONS 1** - Basics of chemical thermodynamics - Thermochemistry – internal energy, enthalpy, entropy - Gibbs energy, kinetics of chemical reactions - Catalysis - Equilibrium of a chemical reaction	**Calculations I.** - Stoichiometric calculations - Solutions – calculations **Dispersion systems, water, solutions** - Preparation of physiological solution
3.	**LAWS OF CHEMICAL REACTIONS 2** - Acid-base balance - Proteolytic reactions, hydrolysis of salts - pH of solutions, buffer solutions - Formation of a solid state - crystallization - Precipitation and complexation reactions	**Calculations II.** - Calculation of pH solutions of acids, bases and salts **Use of calcium hydroxide in dentistry** - Determination of the solubility of calcium hydroxide in water
4.	**ELECTROCHEMISTRY** - Oxidation-reduction reactions - Electrode (redox) potential - Electrodes of the 1st and 2nd type - Electrolysis - Galvanic cell	**Calculations III.** - Buffer solutions **The effect of acids and bases on the pH of the buffer system** - Effect of acids and bases on the pH of the buffer system, Buffer capacity
5.	**METALS** - Division and classification - Basic properties of metals – strength, flexibility, conductivity, malleability, corrosion, toxicity - Metal bonding - Crystallization, crystalline lattices of metals - The most frequently used metals in dentistry	**Laws of chemical reactions** - Precipitation reactions - solubility of sulphates - Calculation of the solubility of various electrolytes from the solubility product constant
6.	**1st Revision test on topics from weeks 1 to 5*** **GENERAL PROPERTIES OF ALLOYS** - Noble and base metals in dental alloys - Cooling curves of pure metals and alloys - Phase diagrams and their use for the preparation of alloys - Eutectic point, eutectic alloys - Alloys in dental materials	**Calculations IV.** - Spectrophotometric calculations **Optical methods** - Spectrophotometric determination of copper with ammonia

7.	**SELECTED ALLOYS USED IN DENTISTRY, AMALGAMS** - The composition of amalgams, their structure and the importance of individual elements in amalgam alloys - Properties of dental amalgams - Phase diagram, setting reactions, corrosion of amalgams - Dental steel	**Metals and their alloys** - Spectrophotometric determination of Fe^{3+} cations in alloys - Corrosion test of dental alloys
8.	**CERAMIC MATERIALS** - Composition of ceramic materials - Properties of ceramic materials - Dental porcelains - Metal-ceramic systems - Dental cements, composition, setting reactions	**Metals and their alloys. Amalgams** - Proof of elements in dental alloys
9.	**MODEL MATERIALS** - Model plaster - production, setting of plaster, mixing ratio - Gypsum volume changes, strength - Classification of dental gypsum - Impression, model plaster, dental stone - The use of basic hydroxides in dentistry	**Ceramic materials** - Solidification and qualitative analysis of glass ionomer cement
10.	**IMPRESSION MATERIALS** - Impression materials, classification and meaning - Solidification reactions of impression materials - Modelling materials: waxes, modelling plaster - Moulding materials: thermal expansion, thermal inversion, heat resistance, porosity, volume changes	**Model materials** - Preparation of gypsum, $CaSO_4 \cdot 2H_2O$ by precipitation - Qualitative proof of the presence of sulphates, chlorides and calcium cations in the supernatant
11.	**2nd Revision test on topics from week 6 to 10*** **POLYMERIZATION** - Characteristics of polymers - Basic reactions of the formation of polymeric substances - Chemical composition of polymers - Classification of polymers	**Impression materials in dentistry** - Gypsum as an impression material - Effect of water to gypsum ratio (V/S) and temperature on gypsum solidification - The effect of chemical catalysts on plaster solidification
12.	**MACROMOLECULAR COMPOUNDS IN DENTISTRY** - Denture base polymers, composition, properties and use - Denture lining materials - Endodontic materials - Artificial teeth - Dental composites resins	**Structure and chemical properties of teeth** - Study of the properties of hydroxyapatite, - Preparation of calcium phosphate, $Ca_3(PO_4)_2$
13.	**CHEMICAL COMPOSITION OF TEETH** - Inorganic components of teeth - Tooth tissues – hard (enamel, dentin, cementum), - soft (dental pulp) - Remineralisation and demineralization of teeth - Factors affecting mineralization and demineralization of teeth	**Mineralization/demineralization of tooth enamel** - Influence of various factors on the mineralization/demineralization of tooth enamel **3rd Revision test on topics of practical exercises and lecture topics from week 11 to 12***
14.	**ACTIVE INGREDIENTS OF TOOTHPASTE AND MOUTHWASH** - Composition – basic elements, thickeners, binders - and stabilizing substances, cleaning agents, aromatic substances - Abrasive substances - Active ingredients – antimicrobial and desensitizing - substances - Allergies	**Overall evaluation of practical exercises** - Individual evaluation of students' work

* Students can come to see how their test was graded within one week of the test