

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

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 <ul style="list-style-type: none"> - Definition of basic terms - Chemical composition and classification of dental materials - Biocompatibility DISPERSION SYSTEMS, WATER, SOLUTIONS <ul style="list-style-type: none"> - Properties of dispersion systems - True and colloidal solutions, electrolytes - Diffusion and osmosis - Surface phenomena, adsorption | Laboratory safety rules Principles of laboratory technique <ul style="list-style-type: none"> - Equipment of laboratory bench - Volume measurement |
| 2. | LAWS OF CHEMICAL REACTIONS 1 <ul style="list-style-type: none"> - Basics of chemical thermodynamics - Thermochemistry – internal energy, enthalpy, entropy - Gibbs energy, kinetics of chemical reactions - Catalysis - Equilibrium of a chemical reaction | Calculations I. <ul style="list-style-type: none"> - Stoichiometric calculations - Solutions – calculations Dispersion systems, water, solutions <ul style="list-style-type: none"> - Preparation of physiological solution |
| 3. | LAWS OF CHEMICAL REACTIONS 2 <ul style="list-style-type: none"> - 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. <ul style="list-style-type: none"> - Calculation of pH solutions of acids, bases and salts Use of calcium hydroxide in dentistry <ul style="list-style-type: none"> - Determination of the solubility of calcium hydroxide in water |
| 4. | ELECTROCHEMISTRY <ul style="list-style-type: none"> - Oxidation-reduction reactions - Electrode (redox) potential - Electrodes of the 1st and 2nd type - Electrolysis - Galvanic cell | Calculations III. <ul style="list-style-type: none"> - Buffer solutions The effect of acids and bases on the pH of the buffer system <ul style="list-style-type: none"> - Effect of acids and bases on the pH of the buffer system, Buffer capacity |
| 5. | METALS <ul style="list-style-type: none"> - 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 <ul style="list-style-type: none"> - 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 <ul style="list-style-type: none"> - 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. <ul style="list-style-type: none"> - Spectrophotometric calculations Optical methods <ul style="list-style-type: none"> - Spectrophotometric determination of copper with ammonia |

| | | |
|-----|--|---|
| 7. | SELECTED ALLOYS USED IN DENTISTRY, AMALGAMS <ul style="list-style-type: none"> - 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 <ul style="list-style-type: none"> - Spectrophotometric determination of Fe^{3+} cations in alloys - Corrosion test of dental alloys |
| 8. | CERAMIC MATERIALS <ul style="list-style-type: none"> - Composition of ceramic materials - Properties of ceramic materials - Dental porcelains - Metal-ceramic systems - Dental cements, composition, setting reactions | Metals and their alloys. Amalgams <ul style="list-style-type: none"> - Proof of elements in dental alloys |
| 9. | MODEL MATERIALS <ul style="list-style-type: none"> - 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 <ul style="list-style-type: none"> - Solidification and qualitative analysis of glass ionomer cement |
| 10. | IMPRESSION MATERIALS <ul style="list-style-type: none"> - 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 <ul style="list-style-type: none"> - Preparation of gypsum, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ 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 <ul style="list-style-type: none"> - Characteristics of polymers - Basic reactions of the formation of polymeric substances - Chemical composition of polymers - Classification of polymers | Impression materials in dentistry <ul style="list-style-type: none"> - 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 <ul style="list-style-type: none"> - Denture base polymers, composition, properties and use - Denture lining materials - Endodontic materials - Artificial teeth - Dental composites resins | Structure and chemical properties of teeth <ul style="list-style-type: none"> - Study of the properties of hydroxyapatite, - Preparation of calcium phosphate, $\text{Ca}_3(\text{PO}_4)_2$ |
| 13. | CHEMICAL COMPOSITION OF TEETH <ul style="list-style-type: none"> - 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 <ul style="list-style-type: none"> - Influence of various factors on the mineralization/demineralization of tooth enamel 3rd Revision test on topics of practical exercises and lecture topics from week 11-12* |
| 14. | ACTIVE INGREDIENTS OF TOOTHPASTE AND MOUTHWASH <ul style="list-style-type: none"> - 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 <ul style="list-style-type: none"> - Individual evaluation of students' work |

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