**MINISTERUL SĂNĂTĂŢII AL REPUBLICII MOLDOVA**

**UNIVERSITATEA DE STAT DE MEDICINĂ ŞI FARMACIE**

**“NICOLAE TESTEMIŢANU”**

**Facultatea Stomatologie**

***CATEDRA PROPEDEUTICĂ STOMATOLOGICĂ „PAVEL GODOROJA”***

BIOMATERIALE ÎN STOMATOLOGIE

A P R O B

Decanul facultăţii Stomatologie

USMF “N.Testemiţanu”

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“ \_\_\_\_” \_\_\_\_\_\_\_\_\_\_\_\_\_\_2018

## *E L A B O R Ă R I M E T O D I C E*

*LA LUCRĂRILE PRACTICE PENTRU STUDENŢII*

*ANULUI I SEMESTRUL II*

***Au fost revizuite și aprobate la ședința catedrei Nr.1 din 01.02.2018***

Şef catedră

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Șef studii

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***PRACTICAL WORKS FOR STUDENTS OF 1st YEAR 2nd SEMESTER***

1. Biomaterials. General concept. Classification. Properties of biomaterials.
2. Basic dental materials. Metals and alloys used in dentistry (Au, Ni-Cr, Co-Cr). Composition and properties.
3. Non-metallic materials. Acrylates. Composition and properties. Practical application. Medical and biological requirements.
4. Non-metallic materials. Ceramics. Composition and properties. Practical application. Medical and biological requirements. Totalization.
5. Auxiliary materials. Wax. Classification of packaging materials.
6. Materials used for taking impression and casting models. Characteristic. Classification. Methods of making impressions and models.
7. Materials used for caries cavities filling. Classification. Requirements for permanent restorative materials.
8. Temporary filling material. Basic properties. Totalization.
9. Dental bases and liners.
10. Glass ionomer cements. Classification. Indications. Contraindications. Advantages and disadvantages.
11. Hybrid glass ionomer cements. Properties.
12. Dental amalgam. Notion. Classification. Properties. Advantages and disadvantages. Indications and contraindications. Totalization.
13. Adhesive systems. General principles of adhesion. Factors that influence adhesion.
14. Classification of dental adhesive systems. Definition. Advantages and disadvantages of different adhesive systems.
15. Composite filling materials. General characteristics. Classification. Chemical curing composites.
16. Light curing composite filling materials. Properties.
17. Root canal filling materials. Classification. The physical and chemical properties. Totalization.

**metodical elaboration №** 1

**topic:** Biomaterials. General concept. Classification. Properties of biomaterials.

**Place of work**: Simulator class.

**Time**: 3 hours.

**Aim of work**: Study of biomaterials and their properties.

**Work plan:**

1. The survey - **45 minutes.**
2. Practical work - **80 minutes**. The students study the general concept of biomaterials: optical, thermical, electrical, mechanic and chemical properties.
3. Conclusion - **10 minutes.**

**CONTROL QUESTIONS:**

1. The notion of biomaterials. Their properties.
2. Optical properties (reflection and refraction, luminescence, transparency, opacity) of the dental materials.
3. Colour and its methods of definition. Colour characteristics.
4. Thermal properties of dental materials (thermal conductivity and thermal expansion).
5. Electrical properties (galvanization).
6. Mechanical properties (deformation, elasticity, plasticity) of biomaterials.
7. Occlusal forces. Elasticity.
8. Characteristics of the compressive pressure. Deterioration and hardness.
9. Chemical properties, corrosion.
10. Biocompatibility of dental materials.

**Independent Work**

To describe the basic properties of biomaterials, draw physical-optical properties (reflection, refraction and dispersion).

**metodical elaboration №** **2**

**Topic:** Basic dental materials. Metals and alloys used in dentistry (Au, Ni-Cr, Co-Cr). Composition and properties.

**Place of work**: Simulator class.

**Time:** 3 hours.

**Aim of work:** To study metals, alloys, composition and their properties.

**Work plan:**

1. The survey **- 45 minutes**.
2. Practical work - **80 minutes** – the students study: the definition, the properties of metals and their alloys; the use of precious and basic alloys for the production of skeletal mobilisable partial prostheses, endosseous implants, fixed dentures, for metal-ceramic works; alloy casting, welding and bonding, alloy recycling, milling methods.
3. Conclusion - **10 minutes**.

**CONTROL QUESTIONS:**

1. Metals and metal alloys. Notion.
2. Classification by Siebert (1983).
3. Noble alloys and their properties (melting range, density, hardness). Gold. Platinum.
4. Alloys based on Co-Cr and Ni-Cr. Their properties.
5. Iron-based alloys based on titanium and copper.
6. Alloys for fixed dentures (noble, non-noble).
7. Alloys for metalic-ceramic constructios.
8. Alloys for skeletal moveable partial prosthesis.
9. Alloy casting, recycling the alloy.
10. Milling methods.
11. Materials used for the production of endosseous implants.
12. Compatibility classes: biotolerance, bioinertness, bioreactivity (bioactive).

**Independent Work**

To fill in the table of metals and alloys used in dentistry.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Nr. | Name of metals, alloys | Positive physical and chemical properties | Negative physical and chemical properties | Use in dentistry |

**metodical elaboration № 3**

**Topic:** Non-metallic materials. Acrylates. Composition and properties. Practical application. Medical and biological requirements.

**Place of work**: Simulator class.

**Time**: 3 hours.

**Aim of work:** To study non-metallic materials, acrylates, composition, properties and practical application.

**Work plan:**

1. The survey **- 45 minutes**.
2. Practical work - **80 minutes.** The students study: the classification of polymeric materials for field use, the properties of acrylic plastic with thermal polymerization and self-polymerization acrylic resins, their release forms, indications; the formation of paste their polymerization.
3. Conclusion - **10 minutes.**

**CONTROL QUESTIONS:**

1. Polymer materials. Chemical composition.
2. Classification of polymeric materials by chemical structure.
3. Classification of polymeric materials for field use.
4. Simple acrylic resins. Release forms.
5. Thermal polymerization of acrylic resins.
6. Forming a paste. Working time, polymerization.
7. The properties of thermal polymerization acrylic resins (structure, porosity, volume changes, thermal expansion, curing shrinkage, thermal shrinkage, biological properties).
8. Indications for use of thermal polymerization acrylic resins. Self-polymerization acrylic resins. Release forms and their polymerization.
9. Properties of self-polymerization acrylic resins (structure, volume change, thermal properties, optical properties, biological properties).
10. Indications for use of self-polymerization resins.

**Independent Work**

To fill in the table: the polymer materials used in dentistry.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Nr. | Name of materials | Positive physical and chemical properties | Negative physical and chemical properties | Use in dentistry |

**metodical elaboration №** 4

**Topic:** Non-metallic materials. Ceramics. Composition and properties. Practical application. Medico-biological requirements. Totalization.

**Place of work**: Simulator class.

**Time: 3 hours.**

**Aim of work:** To study the ceramics used in dentistry, its composition, properties and practical application.

**WORK PLAN**

1. The survey - **45** minutes.
2. Practical work - **80** minutes.
3. Conclusion - **10** minutes.

**CONTROL QUESTIONS:**

* 1. Ceramic masses. Definition. Chemical composition.
	2. Classification of ceramic masses depending on: the melting point, the number of layers and the purpose of use.
	3. The release form: industrial and laboratory.
	4. Stages of ceramic burning on the metal structure.
	5. Characteristics of ceramic masses (volumetric changes, hardness, resistance to pressure, color stability, translucence, biological tolerability).
	6. Notion about new ceramic system: Hi-Ceram-Vita, Ceremony, In-Ceram-Vita, Dicor.
	7. Notion about Empress Technique. Mechanical copying methods.
	8. Computerized grinding methods (CAD-CAM).

**Independent Work**

To fill in the table: Ceramics used in dentistry

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Nr. | Name of materials | Positive physical and chemical properties | Negative physical and chemical properties | Use in dentistry |

**metodical elaboration №** 5

**Topic:** Auxiliary materials. Wax. Tools for processing of hard dental tissues. Tools for processing and finishing of plastics, metals and amiki.

**Place of work**: Simulator class.

**Time: 3 hours.**

**Aim of work:** To study auxiliary materials, different kinds of waxes. Tools for processing hard dental tissues, finishing plastics, metals and ceramics.

**WORK PLAN**

1. The survey - **45** minutes.
2. Practical work - **80** minutes.
3. Conclusion - **10** minutes.

**CONTROL QUESTIONS:**

* + 1. Dental wax. Composition.
		2. Classification by the method of application.
		3. Wax properties: fluidity, dilatation, physical properties, etc.
		4. Release form and properties of the base wax.
		5. Release form and using of casting waxes.
		6. Release form and using of the sticky wax.
		7. Release form of wax for occlusion rim.
		8. Release form and using advantages for canals casting (sprue wax).
		9. Requirements for dental wax.
		10. Classification of packaging materials used in dental laboratory. Properties.

**Independent Work**

To fill in the table: Ceramics used in dentistry.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Nr. | Name of materials | Positive physical and chemical properties | Negative physical and chemical properties | Use in dentistry |

**metodical elaboration №** 6

**Topic:** Materials for lifting prints and casting models. Characteristic. Classification. The materials used. Methods of creating impressions and models.

**Place of work**: Simulator class.

**Time: 3 hours.**

**Aim of work:** To study the materials used for impressions and models of their characteristics.

**WORK PLAN**

1. The survey - **45** minutes.
2. Practical work - **80** minutes.
3. Conclusion - **10** minutes.

**CONTROL QUESTIONS:**

1. The definition of the”Impression”. Characteristic
2. Classification of the impression. Characteristic
3. The impression trays. Characteristic. Classification.
4. Stages and methods of taking the impression.
5. Classification of impression materials by Gherner, Oksman, Napadov, Postolachi and Bîrsa.
6. Basic properties of the impression material (plasticity, accuracy, elasticity, mechanical durability, volume stability, curing time).
7. Secondary properties of the impression material (absence of toxicity and smell, pleasant taste, long-term storage and easy removal after curing).
8. Short presentation reversible and irreversible solid impression materials. Properties.
9. Characteristic of reversible and irreversible elastic impression materials.
10. Medical-biological requirements for the impression materials.
11. Model. Definition. Features.
12. The materials used for the models manufacturing. Their properties and use.
13. Classification of models depending on purpose and tehnique of use.
14. Necessary equipment for models manufacturing.
15. Technique of models manufacturing. Their use in practice.

**Independent Work**

To fill in the table: Materials for removing prints and models used in dentistry.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Nr. | Name of materials | Positive physical and chemical properties | Negative physical and chemical properties | Use in dentistry |

**metodical elaboration №** 7

**Topic:** Materials for caries cavities filling. Classification. Requirements for permanent restorative materials.

**Place of work**: Simulator class.

**Time: 3 hours.**

**Aim of work:** To study the materials used for caries cavity filling. Notion. Classification. Properties.

**WORK PLAN**

1. The survey - **45** minutes.
2. Practical work - **80** minutes.
3. Conclusion - **10** minutes.

**CONTROL QUESTIONS:**

* 1. The concept of filling.
	2. Classification of caries cavity filling materials.
	3. Requirements for temporary filling materials.
	4. Requirements for liners.
	5. Requirements for base filling materials.
	6. Requirements to permanent filling material.
	7. Notion of crown filling.
	8. Notion of crown restoration.
	9. Requirements to permanent filling material.

**Independent Work**

Write a classification of filling materials according to different criterias.

**metodical elaboration №** 8

**Topic:** Temporary filling material. Basic properties. Totalization**.**

**Place of work**: Simulator class.

**Time: 3 hours.**

**Aim of work:** To study the temporary filling material, general characteristics, classification.

**WORK PLAN**

1. The survey - **45** minutes.
2. Practical work - **80** minutes.
3. Conclusion - **10** minutes.

**CONTROL QUESTIONS:**

* + 1. Notion of temporary filling materials.
		2. Requirements for temporary restorative materials.
		3. The difference between temporary fillin material and bandage.
		4. The materials used for bandages.
		5. The materials used for the temporary filling.
		6. Characteristics of artificial dentin. Properties. Chemical composition.
		7. The composition of the dentine-paste and non-eugenol paste. Chemical properties.
		8. Temporary light curing filling material. Properties.
		9. Mixing methods of temporary filling materials.

**Independent Work**

To fill in the table: Materials for temporary fillings used in dentistry.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Nr. | Name of materials | Positive physical and chemical properties | Negative physical and chemical properties | Use in dentistry |

**metodical elaboration №** 9

**Topic:** Dental bases and liners.

**Place of work**: Simulator class.

**Time: 3 hours.**

**Aim of work:** To study materials for medical and insulating pads and their properties.

**WORK PLAN**

1. The survey - **45** minutes.
2. Practical work - **80** minutes.
3. Conclusion - **10** minutes.

**CONTROL QUESTIONS:**

1. Definition and classification of liners.
2. The purpose of liners application.
3. Water-based calcium hydroxide pastes. Properties and indications for use.
4. Calcium hydroxide cements based on resins. Properties and indications.
5. Zinc oxide pastes. Properties and indications.
6. Combined liners. Properties and indications.
7. The technique of liner’s application.
8. The action mechanism of liners.
9. Definition and classification of bases.
10. The purpose of bases application.

**Independent Work**

To fill in the table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Nr. | Name of materials | Positive physical and chemical properties | Negative physical and chemical properties | Use in dentistry |

**metodical elaboration №** 10

**Topic:** Glass Ionomer Cements. Classification. Indications for use. Contraindications. The advantages and disadvantages.

**Place of work**: Simulator class.

**Time: 3 hours.**

**Aim of work:** To study glass ionomer cements, their properties and classification.

**WORK PLAN**

1. The survey - **45** minutes.
2. Practical work - **80** minutes.
3. Conclusion - **10** minutes.

**CONTROL QUESTIONS:**

1. Notion and chemical composition of glass-ionomer cement. Release form.
2. Curing types of glass-ionomer cement.
3. Properties of glass-ionomer cement.
4. Indications and mixing technique of glass-ionomer cement.
5. Classification of glass-ionomer cement by Wilson and McLean (1988).
6. Classification by G. J. Mount and W.R. Hume (1998).
7. Characteristics of Ist type glass-ionomer cement.
8. Characteristics of IInd type glass-ionomer cement.
9. Characteristics of IIIrd type glass-ionomer cement.
10. Adhesion of the ionomeric cements to the dental tissues.

**Independent Work**

Describe in the notebook the method of adhesion to the dental tissues of glass ionomer cements, the chemical reaction of the classical glass ionomer cement.

**metodical elaboration №** 11

**Topic:** Hybrid glass ionomer cements. Properties.

**Place of work**: Simulator class.

**Time: 3 hours.**

**Aim of work:** To study hybrid glass ionomer cements and their properties.

**WORK PLAN**

1. The survey - **45** minutes.
2. Practical work - **80** minutes.
3. Conclusion - **10** minutes.

**CONTROL QUESTIONS:**

1. Hybrid glass ionomer cements. Chemical composition.
2. Types of polymerization. Release form.
3. The curing reaction, properties and indications for use of hybrid glass ionomer cements.
4. Metallic glass ionomer cement. Properties. Indications.
5. The difference between glass ionomer cement with addition of metal particles and metal ceramic “Cermet”.
6. Compomers. Indications for using compomers.
7. The curing reaction of hybrid glass ionomer cements.
8. The structure of hybrid glass ionomer cements after curing reaction.
9. Ormokers. Properties. Indications.

**Independent Work**

Describe in the notebook types of polymerization of hybrid glass ionomer cements.

**metodical elaboration № 12**

**Topic:** Dental amalgam. Classification Definition Properties. Indications for use the advantages and disadvantages. Totalization.

**Place of work**: Simulator class.

**Time: 3 hours.**

**Aim of work:** To study dental amalgams, their properties, classification, apparatus used for mixing amalgam.

**WORK PLAN**

1. The survey - **45** minutes.
2. Practical work - **80** minutes.
3. Conclusion - **10** minutes.

**CONTROL QUESTIONS:**

1. Notion of amalgams.
2. Classification of amalgam by the number of metals in its comosition, by the content of copper in the silver alloy, silver sawdust.
3. Chemical composition of amalgam. The amount of silver in the sawdust. Characteristic.
4. The amount of tin in the sawdust. Characteristic.
5. The amount of copper in the sawdust. Characteristic.
6. The amount of zinc in the sawdust. Characteristic.
7. Characteristics of the liquid mercury.
8. Release form. Equipment and method for mixing the amalgam.
9. Capsules for mixing the amalgams.

**Independent Work**

Describe in the notebook the properties of amalgam, a classification by the number of metals in the composition. Describe the devices for mixing amalgam.

**metodical elaboration № 13**

**Topic:** Adhesive systems. General principles of adhesion. Factors influencing adhesion.

**Place of work**: Simulator class.

**Time: 3 hours.**

**Aim of work:** To study the general principles of adhesive systems and factors that affect adhesion.

**WORK PLAN**

1. The survey - **45** minutes.
2. Practical work - **80** minutes.
3. Conclusion - **10** minutes.

**CONTROL QUESTIONS:**

1. Notion of adhesion. General principles of adhesion.
2. Physical mechanisms of adhesion.
3. Chemical mechanisms of adhesion.
4. Specific aspects of adhesion to hard tissues of the tooth.
5. Adhesion to enamel, morphological and functional features of enamel.
6. Preparation of enamel for adhesion.
7. The etching mechanism of the enamel.
8. Adhesion to dentine, morphological and functional features of dentine.
9. Variants of dental tissue.
10. Factors that influence the adhesion (working surface, the adhesive nature, the material used for restorations, skills and a methods of use, depending on the producer).

**Independent Work**

Describe in the copybook the general principles of adhesion, physical and chemical adhesion.

**metodical elaboration №** 14

**Topic:** Classification of dental adhesive systems. Definition. Advantages and disadvantages of different adhesive systems.

**Place of work**: Simulator class.

**Time: 3 hours.**

**Aim of work:** To study different generations of adhesive systems.

**WORK PLAN**

1. The survey - **45** minutes.
2. Practical work - **80** minutes.
3. Conclusion - **10** minutes.

**CONTROL QUESTIONS:**

1. Classification of adhesive systems in association with (generations, type of polymerization, number of stages, pH, restoration material requiring adhesion).
2. IIIrd generation (notion of primer and bonding).
3. IVth generation, characteristics, the etching procedure, advantages and disadvantages.
4. Vth generation characteristics, advantages and disadvantages.
5. VIth generation characteristics, advantages and disadvantages.
6. VIIth generation characteristics, advantages and disadvantages

**Independent Work**

Describe in the copybookthe characteristics of different generations of adhesive systems.

**metodical elaboration № 15**

**Topic:** Composite filling materials. General characteristics. Classification. Chemical curing composites.

**Place of work**: Simulator class.

**Time: 3 hours.**

**Aim of work:** To study composite filling materials, their characteristics and classification.

**WORK PLAN**

1. The survey - 45 minutes.
2. Practical work - 80 minutes.
3. Conclusion - 10 minutes.

**CONTROL QUESTIONS:**

1. Notion of composite materials.
2. Classification of composite materials by Lutz, Phillips and Willems.
3. Organic monomers (BIS-GMA, UDMA, DGMA, TGDMA).
4. Inorganic fillers.
5. Silants, polymerizations initiators, stabilizers, colorants and pigments.
6. Macro-filled composite filling materials (classical and modern).
7. Micro-filled composite filling materials.
8. Hybrid composite materials.
9. Release form (powder-liquid, liquid-paste, paste-paste, and paste in the syringe).
10. Classification of composites by the method of polymerizations.
11. Chemical curing composites. The mixing tehnique.

**Independent Work**

Describe in the copybook the main properties of chemical curing composites and their composition.

**metodical elaboration № 16**

**Topic:** Curing composite filling materials. Properties.

**Place of work**: Simulator class.

**Time: 3 hours.**

**Aim of work:** To study light curing composite filling materials, their properties and light curring lamp.

**WORK PLAN**

1. The survey - **45** minutes.
2. Practical work - **80** minutes.
3. Conclusion - **10** minutes.

**CONTROL QUESTIONS:**

1. Light curing compositefilling materials, polymerized by UV radiation.
2. Light curing composite filling materials, polymerized by the halogen lamp.
3. The main parts of light curing lamp (9 parts).
4. Light curing composite filling materials, polymerized by laser.
5. Dual curing composite filling materials.
6. Biocompatibility (the pulp reaction, microcracks, the irritation caused by the curing lamp, gingival tissue reaction).
7. Water absorption and solubility.
8. Destruction in the oral cavity.
9. Color stability.
10. Polymerization shrinkage.
11. Mechanical properties (hardness, wear, fracture resistance, ductility, durability).
12. Thermal properties.

**Independent Work**

Draw in the copybook the main parts of the light curing lamp.

**metodical elaboration № 17**

**Topic:** Materials for root canal filling. Classification. The physical and chemical properties. Totalization.

**Place of work**: Simulator class.

**Time: 3 hours.**

**Aim of work:** To study materials for root canal filling, their properties and classification.

**WORK PLAN**

1. The survey - **45** minutes.
2. Practical work - **80** minutes.
3. Conclusion - **10** minutes.

**CONTROL QUESTIONS:**

1. Materials for root canals filling. Classification.
2. Temporary root canals filling materials based on calcium hydroxide. Indications for use. Properties. Release form.
3. Temporary materials for root canal filling based on iodoform. Indications.Properties. Release form.
4. Temporary root canal filling material based on paraformaldehyde. Indications. Properties. Release form.
5. Materials for permanent root canal filling. Characteristics.
6. Materials for permanent root canal filling based on glass-ionomer cement. Characteristics.
7. Materials for permanent root canal filling based on gutta-percha. Characteristics..
8. Materials for permanent root canal filling based on elastic resins. Characteristics.
9. Materials for permanent root canal filling based on epoxy resins. Characteristics, properties
10. Primary solid materials for permanent root canal filling.
11. Gutta-percha points. Properties and release form.
12. Materials including antiseptic properties.
13. Irrigation and intracanalar treatment (solutions for irrigation, solutions and gels for lubrication and chemical enlargement of root canals).

**Independent Work**

To fill in the table: Materials for root canal filling used in dentistry.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Nr. | Name of materials | Positive physical and chemical properties | Negative physical and chemical properties | Use in dentistry |

**RECOMMENDED LITERATURE:**

A. Obligatory:

1. Note de curs.
2. Nicolau G., Terehov A., Năstase C., Nicolaiciuc V. Odontologie practică modernă. Iași, 2010, 448 p.
3. Mount G.J., Hume W.R. Conservarea și restaurarea structurilor dentare. București, 1999, 272p.
4. Borș A., Szekely M., Molnar-Varlam C. Tehnici adezive moderne în medicina dentară. Târgul-Mureș, 2015, 104 p.
5. Manolea H. O. Materiale Dentare. Note de curs pentru studenții Facultății de Medicină Dentară. Craiova, 2001, 186 p.

B. Supplementary:

1. Iliescu A., Gafar M. Cariologie și odontoterapie restauratoare. București, 2006, 494 p.
2. McCabe J. F., Angus W.G.Walls. Applied Dental Materials. Singapore, 2008, 303 p.
3. Bonsor S. J., Pearson G. J. Applied Dental Materials. Livingstone, 2013, 454 p.
4. Николау Г.Ю., Терехов А.Б., Настасе К.И. Основы практической Кариесологии.

Кишинэу,2008, 176 стр.

1. Копейкин В.Н., Демнер Л.М. Зубопротезная техника, Москва, 2003. 400 стр.