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**Faculty of stomatology**

***CHAIR OF STOMATOLOGICAL PROPAEDEUTICS “PAVEL GODOROJA”***

BIOMATERIALS IN STOMATOLOGY

## *METHODICAL ELABORATION*

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

***They were reviewed and approved at the chair meeting Nr.9 on 31.01.2020***

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

1. Biomaterials. Notion. 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. Used materials.
7. Restorative materials. Classification. Requirements for permanent restorative materials.
8. Temporary filling material. Characteristics. Test**.**
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. Composite materials. General characteristics. Classification. Chemical cured composites.
15. Light cured composite filling materials. Properties.
16. Root canal filling materials. Classification. The physical and chemical properties
17. Root canal filling materials. Permanent root canal filling materials. Test.

**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 notions of biomaterials: optical, thermical, electrical, mechanic and chemical properties.
3. Conclusion - **10 minutes.**

**CONTROL QUESTIONS:**

1. The notion of biomaterials. Their properties.
2. Physical properties (melting temperature, colour, luminescence, optical effects) of the dental materials.
3. Thermal properties of dental materials (thermal conductivity and thermal expansion).
4. Electrical properties (galvanization).
5. Mechanical properties (deformation, elasticity, plasticity) of biomaterials.
6. Chemical properties, corrosion.
7. Biocompatibility of dental materials.

**Homework**

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, fixed dentures, for metal-ceramic works; alloy casting, welding and bonding, alloy recycling.
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.

**Homework**

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 stomatology |

**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 based on usage, the properties of acrylic plastic with thermal polymerization and self-polymerization acrylic resins, their release forms, indications; the formation of paste and 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 by usage.
4. Simple acrylic resins. Release forms.
5. Light cured acrylic resins.
6. Forming a paste. Working time, polymerization.
7. The properties of light cured acrylic acrylic.
8. Indications of light cured acrylic acrylic resins.
9. Self cured acrylic resins. Release forms and their polymerization.
10. Properties of self cured acrylic resins.
11. Indications for use of self cured resins.

**Homework**

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 stomatology |

**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.
	6. New ceramic systems: Hi-Ceram-Vita, Ceremony, In-Ceram-Vita, Dicor, Empress Technique.
	7. Mechanical copying methods.
	8. Computerized milling methods (CAD-CAM).

**Homework**

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 stomatology |

**metodical elaboration №** 5

**Topic:** Auxiliary materials. Wax. Classification of packaging materials.

**Place of work**: Simulator class.

**Time: 3 hours.**

**Aim of work:** To study auxiliary materials, different types of waxes.

**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.

**Homework**

To fill in the table: Dental wax.

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

**metodical elaboration №** 6

**Topic:** Materials for impression and casting models. Characteristic. Classification. The materials used

**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 notion of Impression. Classification of the impression.
2. The impression trays. Characteristics. Classification.
3. Classification of impression materials by Gherner, Oksman, Napadov, Postolachi and Bîrsa.
4. Basic properties of the impression material (plasticity, accuracy, elasticity, mechanical durability, volume stability, curing time).
5. Secondary properties of the impression material (absence of toxicity and smell, pleasant taste, long-term storage and easy removal after curing).
6. Reversible and irreversible solid impression materials. Properties.
7. Characteristics of reversible and irreversible elastic impression materials.
8. Medico-biological requirements for the impression materials.
9. Model. Definition. Characteristics.
10. The materials used for the models manufacturing. Their properties and use.
11. Classification of models depending on purpose and tehnique of use.
12. Necessary equipment for models manufacturing.

**Homework**

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

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

**metodical elaboration №** 7

**Topic:** Restorative materials. 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 notion of obturation.
	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 for permanent filling material.
	7. Notion of crown restoration.

**Homework**

Write a classification of filling materials according to different criterias.

**metodical elaboration №** 8

**Topic:** Temporary filling material. Characteristics. 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 filling material and dressing.
		4. Notion of dressing.
		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.
		8. Temporary light curing filling material. Properties.
		9. Mixing methods of temporary filling materials.

**Homework**

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

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

**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 curative materials.
2. The purpose of curative materials application.
3. Calcium hydroxide cements. Properties and indications.
4. Zinc oxide pastes (ZOE). Properties and indications.
5. Combined pastes. Properties and indications.
6. The technique of bases application.
7. Definition and classification of liners.
8. Classification and the purpose of liners application.

**Homework**

To fill in the table:

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

**metodical elaboration №** 10

**Topic:** Glass ionomer cements. Classification. Indications. 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. Setting reaction of glass ionomer cement.
3. Properties of glass ionomer cement.
4. Indications of glass ionomer cement.
5. Classification of glass ionomer cements by Wilson and McLean (1988), by G. J. Mount and W.R. Hume (1998).
6. Characteristics of Ist type glass-ionomer cement.
7. Characteristics of IInd type glass-ionomer cement.
8. Characteristics of IIIrd type glass-ionomer cement.

**Homework**

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. Notion. Chemical composition.
2. Types of polymerization. Release form.
3. The setting reaction, properties and indications for use of hybrid glass ionomer cements.
4. Metallic glass ionomer cement. Properties. Indications.
5. Compomers. Indications for using compomers. The setting reaction.
6. The structure of hybrid glass ionomer cements by the setting reaction.
7. Ormocers. Properties. Indications.

**Homework**

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

**metodical elaboration № 12**

**Topic:** Dental amalgam. Notion. Classification. Properties. Indications. 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. Chemical composition of amalgam.
3. The amount of silver in the powder.
4. Characteristics of the dental amalgam. Release form.
5. Equipment and method for mixing the amalgam.
6. Capsules for mixing the amalgams.

**Homework**

Describe in the notebook the properties of amalgam, the 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.
2. General principles of adhesion.
3. Specific aspects of adhesion to hard tissues of the tooth.
4. Adhesion to enamel, morphological and functional characteristics of enamel.
5. Preparation of enamel for adhesion.
6. Adhesion to dentine, morphological and functional features of dentine.
7. Factors that influence the adhesion (working surface, the adhesive nature, the material used for restorations, the used methods, the producer).
8. Classification of adhesive systems.
9. The characheristics of adhesive systems.
10. Advantages and disadvantages.

**Homework**

Describe in the copybook the general principles of adhesion and the characteristics of different generations of adhesive systems.

**metodical elaboration № 14**

**Topic:** Composite materials. General characteristics. Classification. Chemical cured 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.
3. Organic monomers (BIS-GMA, UDMA, DGMA, TGDMA).
4. Inorganic phase.
5. Silants, polymerizations initiators, stabilizers, colorants and pigments.
6. Macro-filled composite filling materials (classical and modern).
7. Micro-filled composite filling materials.
8. Self-cured composite materials. Release form.
9. Advantages and disadvantages.

**Homework**

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

**metodical elaboration № 15**

**Topic:** Light cured 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. Hybrid composites. Characteristics.
2. Light cured compositefilling materials.
3. Advantages and disadvantages.
4. Classification of light cured composite materials by consistency. Characteristics
5. Flowable composite materials. Characteristics. Indications. Release form.
6. Packable composite materials. Characteristics. Indications. Release form.
7. The main parts of light curing lamp (9 parts).

**Homework**

Draw in the copybook the main parts of the light curing lamp and describe the light-cured composite materials.

**metodical elaboration № 16**

**Topic:** Root canal filling materials. Classification. The physical and chemical properties.

**Place of work**: Simulator class.

**Time: 3 hours.**

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

**WORK PLAN**

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

**CONTROL QUESTIONS:**

1. Root canal filling materials.
2. Requirements for root canals filling materials.
3. Classification.
4. Temporary root canals filling materials based on calcium hydroxide. Indications. Properties. Release form.
5. Temporary root canal filling materials based on iodoform. Indications. Properties. Release form.
6. Permanent root canal filling materials. Characteristics.

**Homework**

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

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

**metodical elaboration № 17**

**Topic:** Root canal filling materials. Permanent root canal filling materials. Totalization.

**Place of work**: Simulator class.

**Time: 3 hours.**

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

**WORK PLAN**

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

**CONTROL QUESTIONS:**

1. Permanent root canal filling materials. Characteristics.
2. Permanent root canal filling materials based on ZOE cement. Characteristics.
3. Zync-phosphate cements.
4. Permanent root canal filling materials based on epoxy resins. Characteristics, properties
5. Permanent root canal filling materials based on resorcinol-formaldehyde.
6. Permanent root canal filling materials based on glass ionomer cements. Characteristics.
7. Primary solid materials for permanent root canal filling.
8. Gutta-percha. Properties and release form.
9. Silver points.

**Homework**

To fill in the table: root canal filling materials used in stomatology.

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

**RECOMMENDED LITERATURE:**

A. Mandatory:

1. Course notes.
2. John J Manappallil Basic Dental Materials. New Delhi, London, Philadelphia, Panama, 2016, 606 p.
3. McCabe J. F., Angus W.G.Walls. Applied Dental Materials. Singapore, 2008, 303 p.
4. Bonsor S. J., Pearson G. J. Applied Dental Materials. Livingstone, 2013, 454 p.
5. Bîrsa Gh., Postolachi I. Tehnici de confecționare a protezelor dentare. Chișinău 1994.
6. Postolachi I. şi colab. Protetica Dentară. Chişinău, „Ştiinţa”1993
7. Nicolau G., Terehov A., Năstase C., Nicolaiciuc V. Odontologie practică modernă. Iași, 2010, 448 p.

B. Supplementary:

1. Iliescu A., Gafar M. Cariologie și odontoterapie restauratoare. București, 2006, 494 p.
2. Николау Г.Ю., Терехов А.Б., Настасе К.И. Основы практической Кариесологии. Кишинэу,2008, 176 стр.
3. Копейкин В.Н., Демнер Л.М. Зубопротезная техника, Москва, 2003. 400 стр.