

МИНИСТЕРСТВО ЗДРАВООХРАНЕНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ
БЕЛОРУССКИЙ ГОСУДАРСТВЕННЫЙ МЕДИЦИНСКИЙ УНИВЕРСИТЕТ
КАФЕДРА МОРФОЛОГИИ ЧЕЛОВЕКА

Ю. М. Мельниченко, В. В. Заточная

**ГИСТОЛОГИЧЕСКОЕ СТРОЕНИЕ
И РАЗВИТИЕ ОРГАНОВ РОТОВОЙ ПОЛОСТИ
ORAL HISTOLOGY AND EMBRYOLOGY**

Практикум



Минск БГМУ 2025

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М48

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ORAL HISTOLOGY AND EMBRYOLOGY

Практикум

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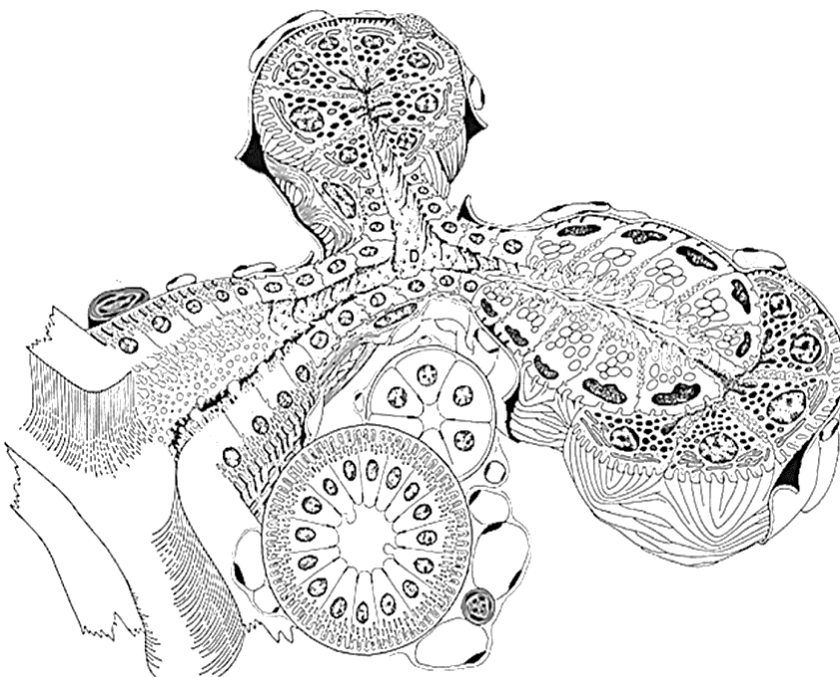
TOPIC 1
GLANDS OF THE ORAL CAVITY. COMPOSITION AND FUNCTIONS OF SALIVA.
THE PRINCIPLES OF THE STRUCTURAL ORGANIZATION OF THE SALIVARY
GLANDS. MICROSCOPIC STRUCTURE OF THE PAROTID, SUBMANDIBULAR
AND SUBLINGUAL GLANDS

Control questions:

1. Principles of structural organization of the major salivary glands.
2. Structure of the secretory units and excretory ducts
3. Structural features of the parotid, submandibular and sublingual gland.
4. Comparative characteristics of the secretory portions of the parotid, submandibular and sublingual glands.
5. Composition and functions of saliva. Saliva as an object of research and diagnostics. Endocrine function of the salivary glands.
6. Topography and structural features of minor salivary glands.
7. Age-related changes in the salivary glands.

MATERIAL FOR INDEPENDENT WORK

Secretory units and intralobular ducts of major salivary glands

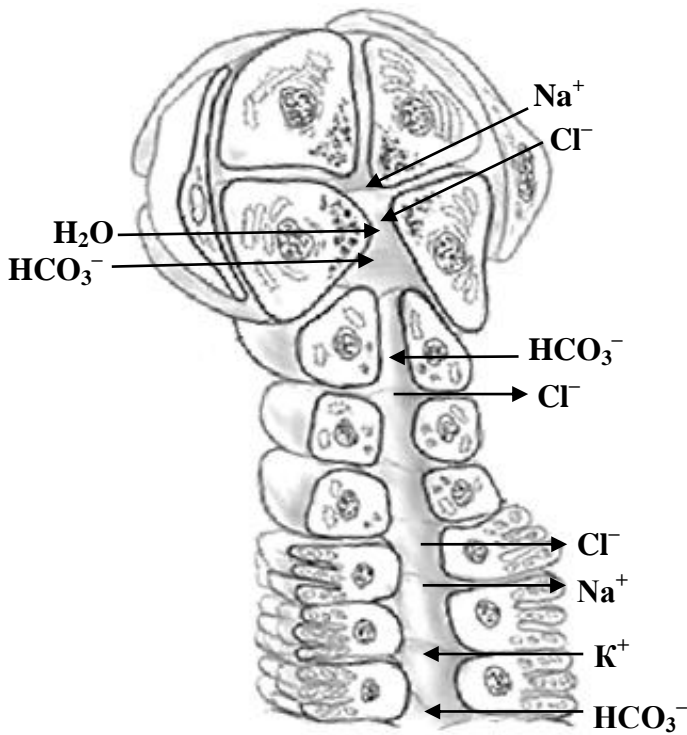


Color the following structures, using a different color for each:

- serocytes (serous acinus)
- mucocytes
- serous demilune
- basement membrane
- intercalated duct
- striated duct
- blood vessels
- fat cells

Scheme of histological structure

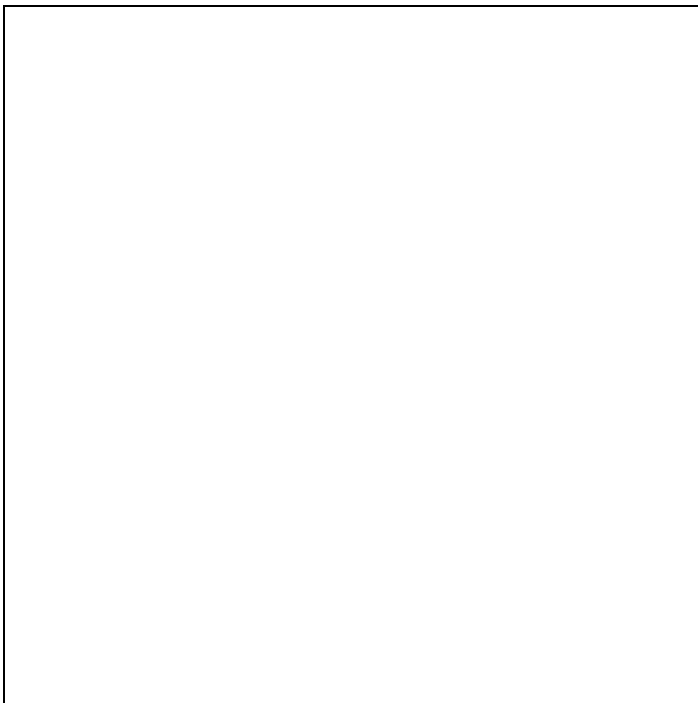
Mechanism of salivary gland secretion



Color the following structures, using a different color for each:

- serocytes
- myoepithelial cells
- intercalated duct
- striated duct
- secretory granules

Parotid gland



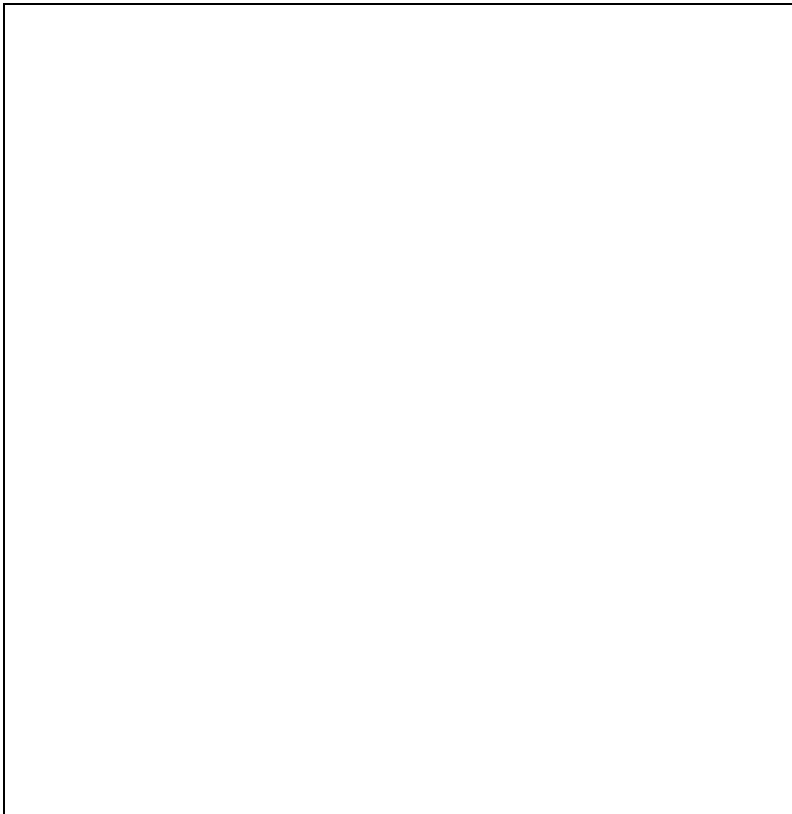
Draw and indicate the following structures:

1. Serous acini
2. Myoepithelial cells
3. Intercalated duct
4. Striated duct
5. Blood vessels
6. Fat cells
7. Interlobular connective tissue
8. Interlobular duct

Histology slide

(H&E, high-power magnification)

Submandibular gland



Draw and indicate the following structures:

1. Serous acini
2. Mixed (seromucous) acini
3. Serous demilune
4. Myoepithelial cells
5. Intercalated duct
6. Striated duct
7. Blood vessels
8. Fat cells
9. Interlobular connective tissue
10. Interlobular duct

Histology slide
(H&E, high-power magnification)

THE LESSON IS COMPLETED

Teacher _____

« _____ » _____

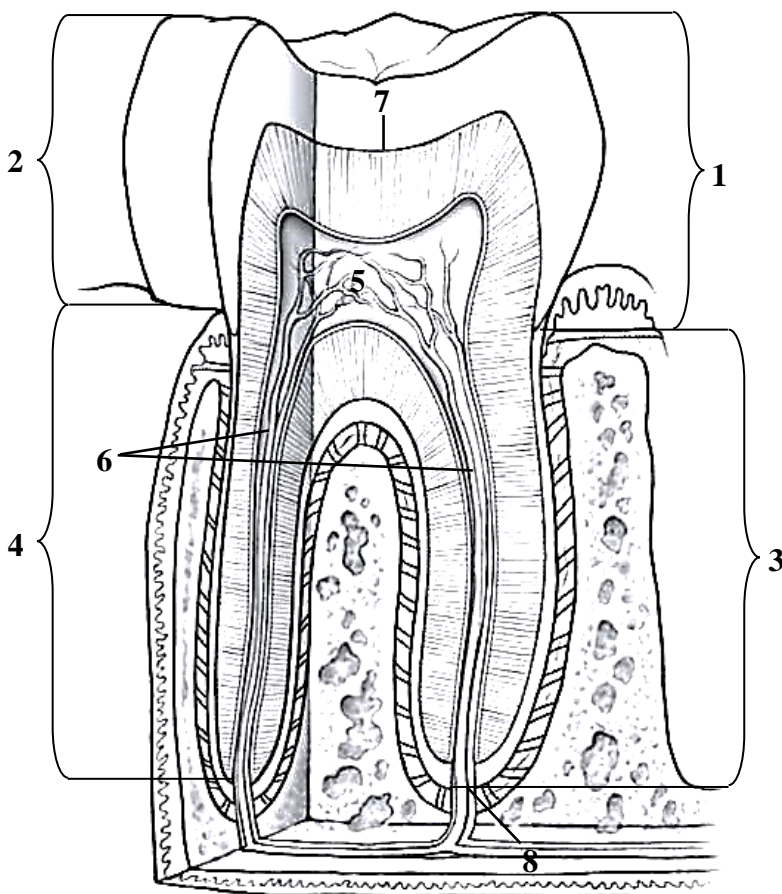
TOPIC 2
GENERAL PLAN OF THE STRUCTURAL ORGANIZATION OF THE TOOTH.
MICROSCOPIC STRUCTURE OF ENAMEL. METABOLISM, NUTRITION,
AGE-RELATED CHANGES IN ENAMEL

Control questions:

1. General plan of the structural organization of the tooth. Functions of the teeth.
2. General characteristics of enamel, its functions. Structure of enamel: enamel rod, interrod enamel.
3. Optical phenomenon on longitudinal ground sections of tooth (Hunter–Schreger bands).
4. Incremental growth lines in enamel.
5. Enamel lamellae, tufts, spindles. Dentinoenamel junction.
6. Remineralization and demineralization of enamel.
7. Surface coatings of enamel (perikymata, cuticle, pellicle, dental plaque, calculus), their composition and functions.

MATERIAL FOR INDEPENDENT WORK

Permanent tooth



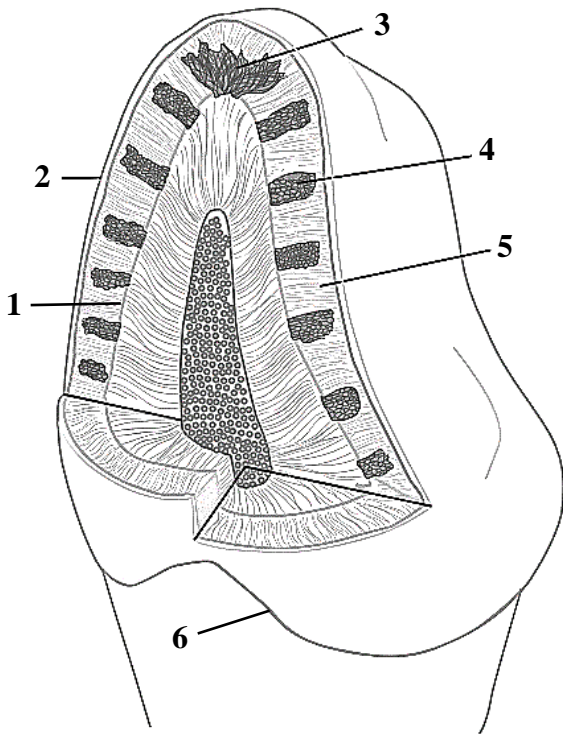
Name structures, indicated by the numbers:

1. _____ crown
2. _____ crown
3. _____ root
4. _____ root
5. _____ chamber
6. _____ canals
7. _____ junction
8. _____ foramen

Color the following structures, using a different color for each structure:

- enamel
- dentin
- cementum
- pulp
- periodontal ligament
- alveolar bone
- gingiva

Diagram of tooth crown (longitudinal and transverse cross-sections)



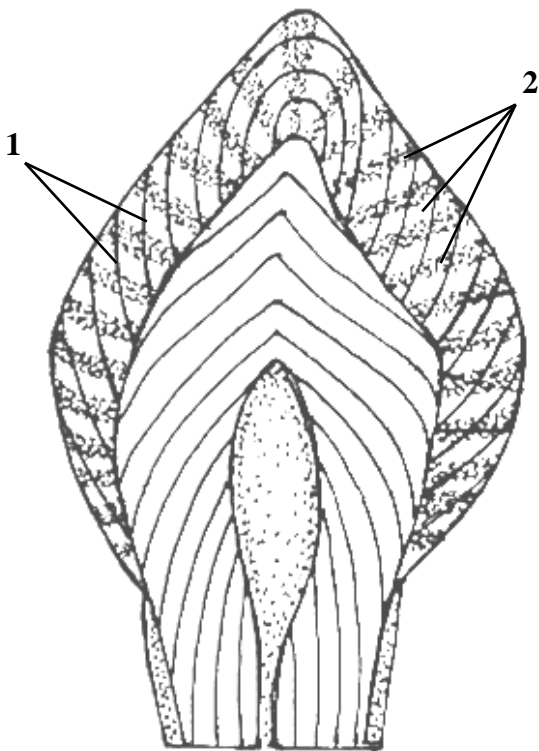
Name structures, indicated by the numbers:

1. _____ junction
2. _____ enamel
3. Gnarled enamel
4. _____
5. _____
6. _____ junction

Color the following structures using different color for each structure:

- dentin
- cementum
- pulp

Diagram of longitudinal ground tooth section



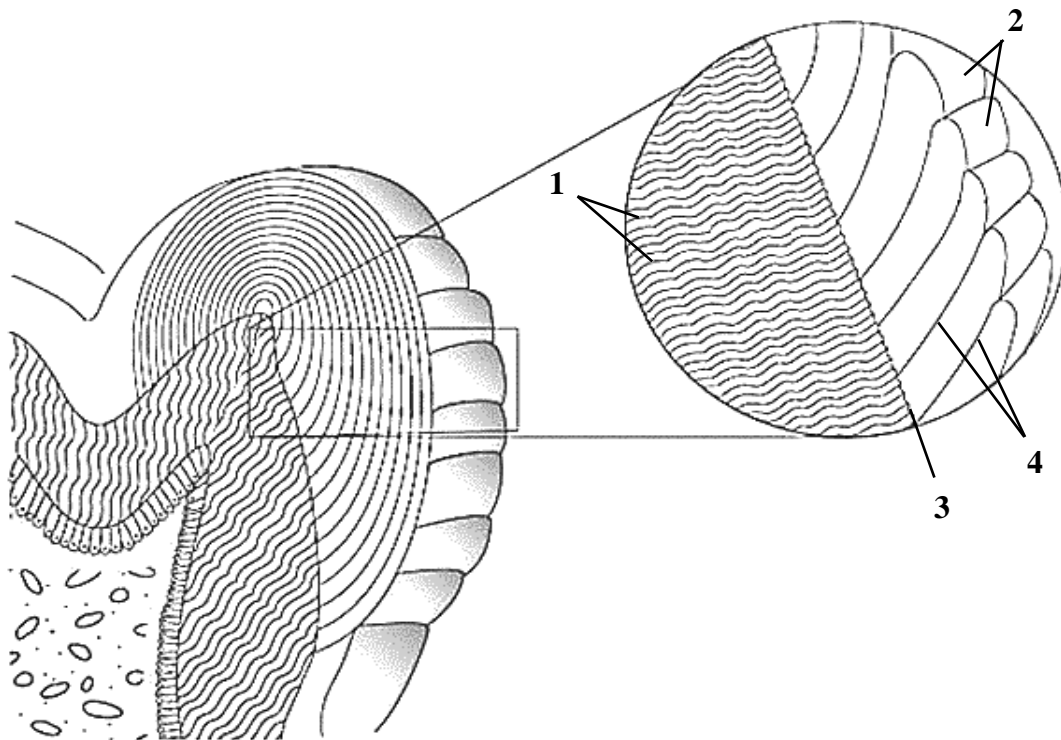
Name structures, indicated by the numbers:

1. _____
2. _____

Color the following structures using different color for each structure:

- dentin
- cementum
- pulp

Diagram of longitudinal ground tooth section. Incremental growth lines



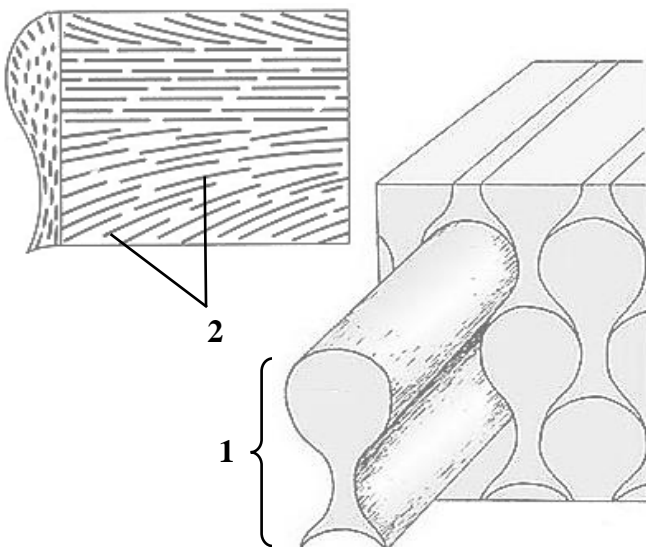
Name structures, indicated by the numbers:

1. _____
2. _____
3. _____ junction
4. _____

Color the following structures using different color for each structure:

- enamel
- dentin
- pulp
- odontoblasts

Diagram of microscopic structure of dental enamel



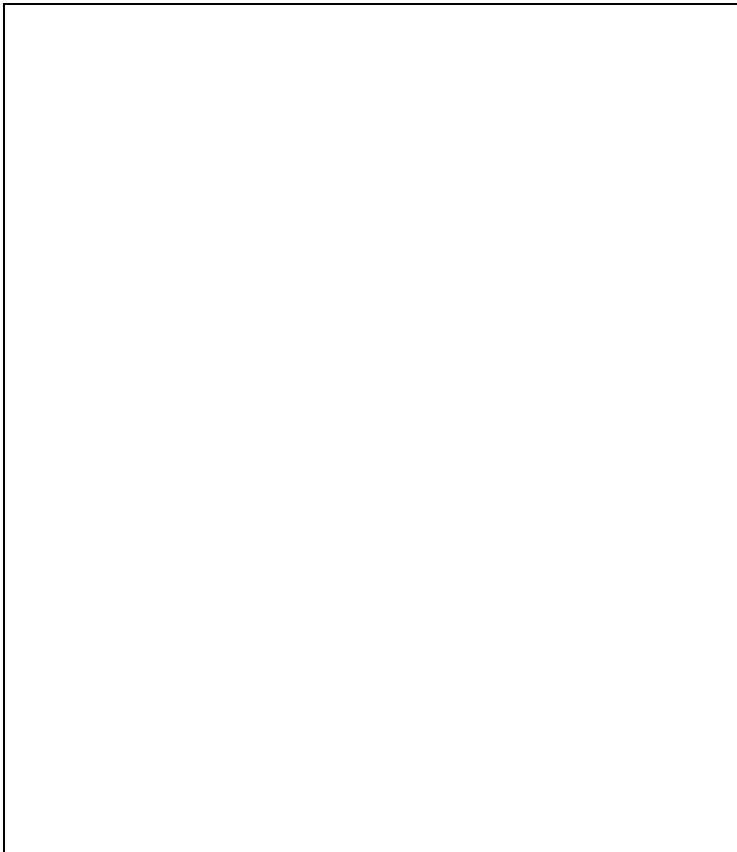
Name structures, indicated by the numbers:

1. _____
2. _____ crystals

Color the following structures using different color for each structure:

- head of the enamel rod
- tail of the enamel rod
- enamel rod sheath

Histology slide: Longitudinal ground tooth section



Draw the hard tissues of the crown of the tooth and indicate the following structures:

1. Enamel
2. Enamel spindles
3. Enamel tufts
4. Enamel lamella
5. Dentinoenamel junction
6. Dentin
7. Dentinal tubules

For notes:

THE LESSON IS COMPLETED

Teacher _____

« ____ » _____

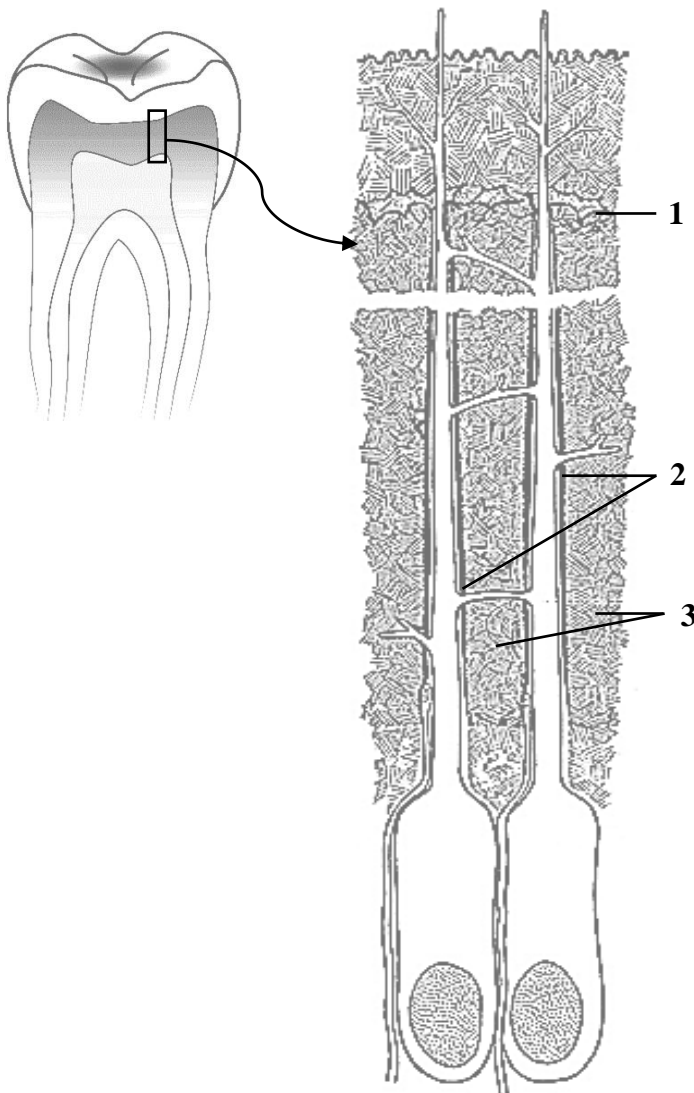
TOPIC 3
MICROSCOPIC STRUCTURE OF DENTIN. BLOOD SUPPLY, INNERVATION,
PHYSIOLOGICAL AND REPARATIVE REGENERATION OF DENTIN

Control questions:

1. Types of dentin (according to topography, pattern and degree of mineralization). Physical properties and chemical composition of dentin.
2. Microscopic structure of the dentin. Dentinal fluid.
3. Predentin, mantle dentin and circumpulpal dentin.
4. Primary, secondary and tertiary dentin.
5. Denticles. Pathological changes in dentin.

MATERIAL FOR INDEPENDENT WORK

Microscopic structure of dentin



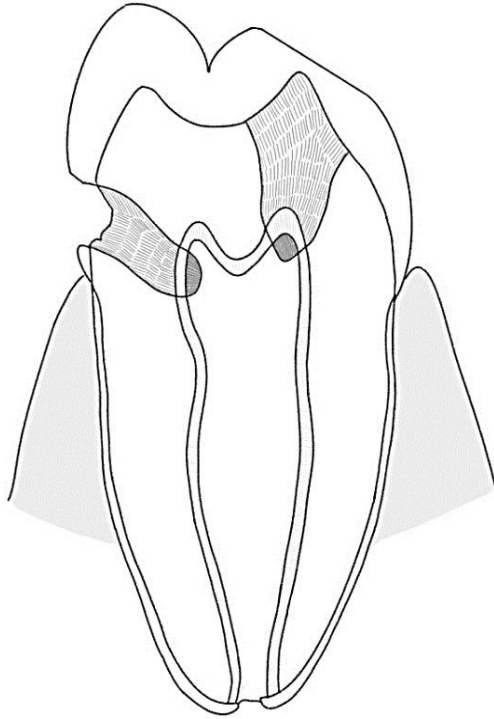
Name structures, indicated by the numbers:

1. _____ dentin
2. Peritubular dentin
3. _____ dentin

Color the following structures, using a different color for each structure:

- mantle dentin
- circumpulpal dentin
- predentin
- odontoblasts

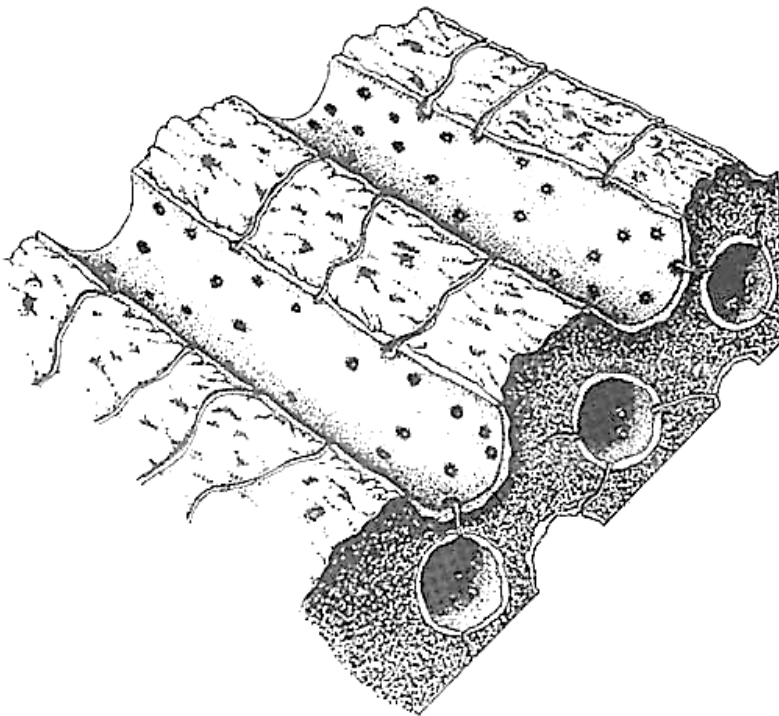
Primary, secondary, and tertiary dentin



Color the following structures, using a different color for each structure:

- enamel
- primary dentin
- secondary dentin
- tertiary dentin
- pulp cavity
- cementum
- dead tracts
- sclerotic dentin

Peritubular and intertubular dentin



Color the following structures, using a different color for each structure:

- peritubular dentin
- intertubular dentin
- anastomoses between dentinal tubules

THE LESSON IS COMPLETED

Teacher _____

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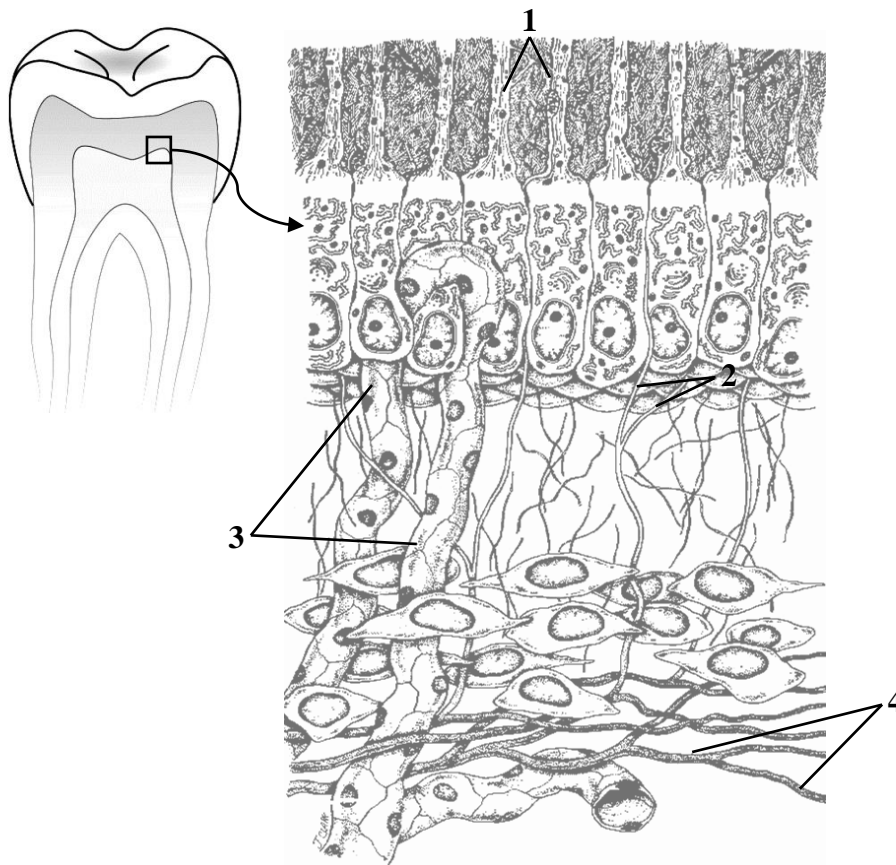
TOPIC 4
MICROSCOPIC STRUCTURE OF THE TOOTH PULP. FUNCTIONS, BLOOD SUPPLY,
INNERVATION, AGE-RELATED CHANGES IN THE PULP. PERIODONTIUM.
CEMENTUM: CELLULAR AND ACELLULAR

Control questions:

1. General characteristics and functions of the pulp.
2. Microscopic structure of the pulp, blood supply and innervation.
3. Differences between the coronal and root pulp.
4. Differences between the pulp of deciduous and permanent teeth.
5. Regeneration and age-related changes in the pulp. Denticles.
6. Structural organization of the tooth supporting apparatus.
7. General characteristics and functions of cementum. Acellular and cellular cementum.
8. Participation of cementum in reparative processes. Hypercementosis, its types.

MATERIAL FOR INDEPENDENT WORK

Microscopic structure of the dental pulp



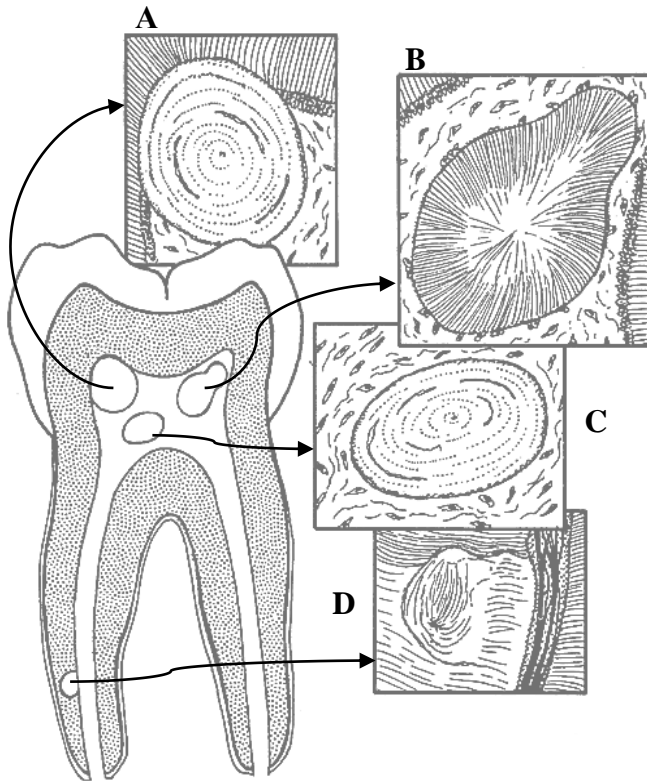
Name structures, indicated by the numbers:

1. _____
2. _____
3. _____
4. _____

Color the following structures, using a different color for each structure:

- predentin
- odontoblasts
- cell-free zone
- cell-rich zone

Pulp stones (denticles)



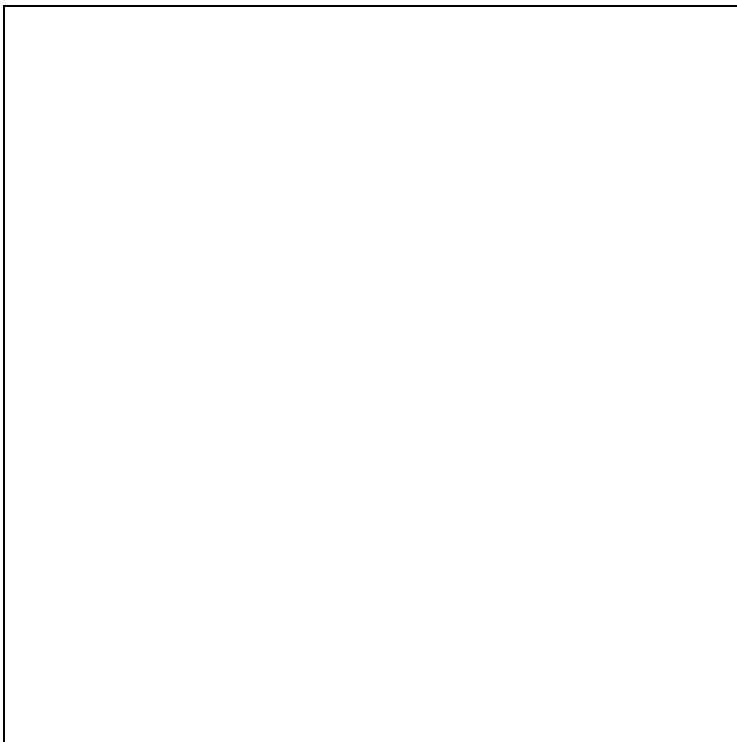
Name denticles, indicated by the letters:

- A. _____
 B. _____
 C. _____
 D. _____

Color the following structures, using a different color for each structure:

- free denticles
 attached denticle
 embedded denticle

Histology slide: Longitudinal section tooth of a decalcified tooth



Draw and indicate the following structures:

I. Dentin

1. Dentinal tubules

II. Predentin

2. Mineralization front

III. Pulp

3. Bodies of odontoblasts

4. Cell-free zone

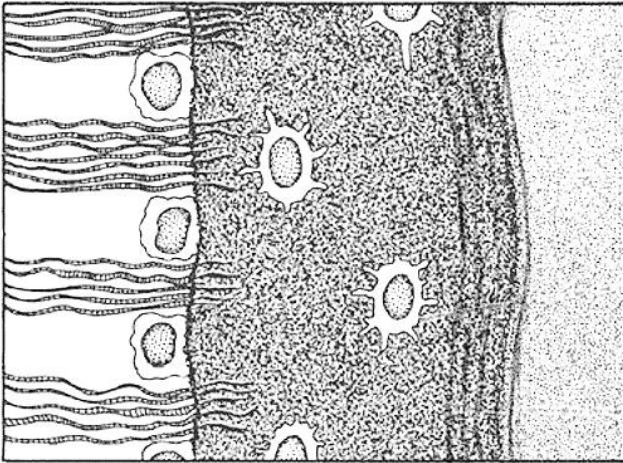
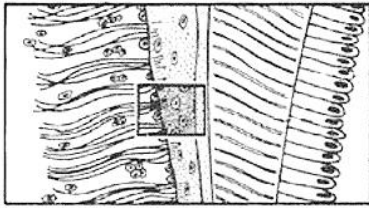
5. Cell-rich zone

6. Central pulp

(loose connective tissue with blood vessels and nerves)

H&E, high magnification

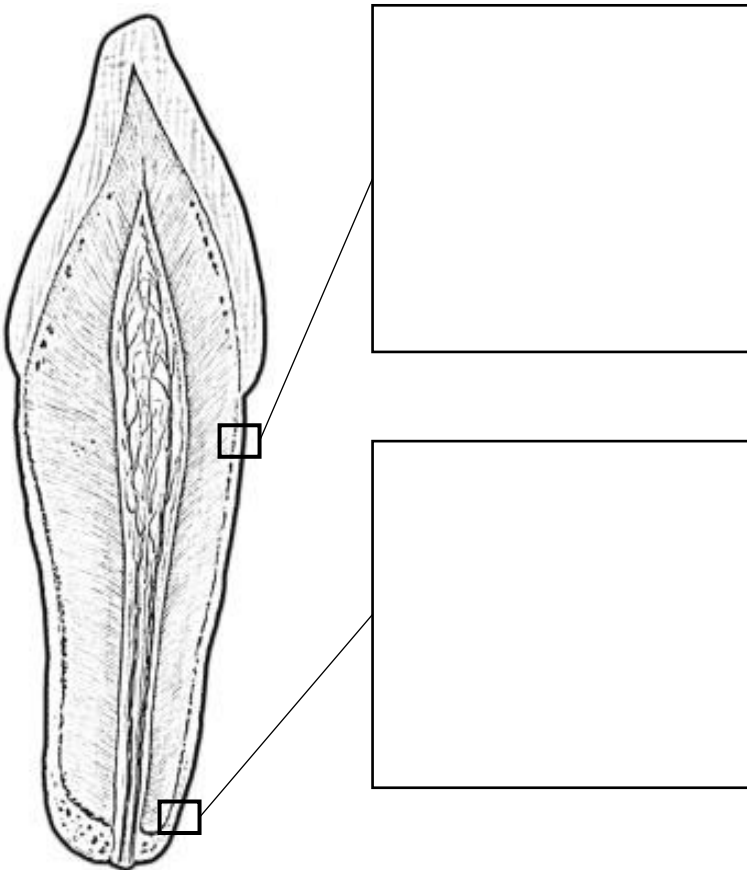
Diagram of tooth cementum structure



Color the following structures, using a different color for each structure:

- dentin
- odontoblasts
- periodontal ligament
- cementocytes
- cementoblasts
- intermediate cementum
- acellular cementum
- cellular cementum

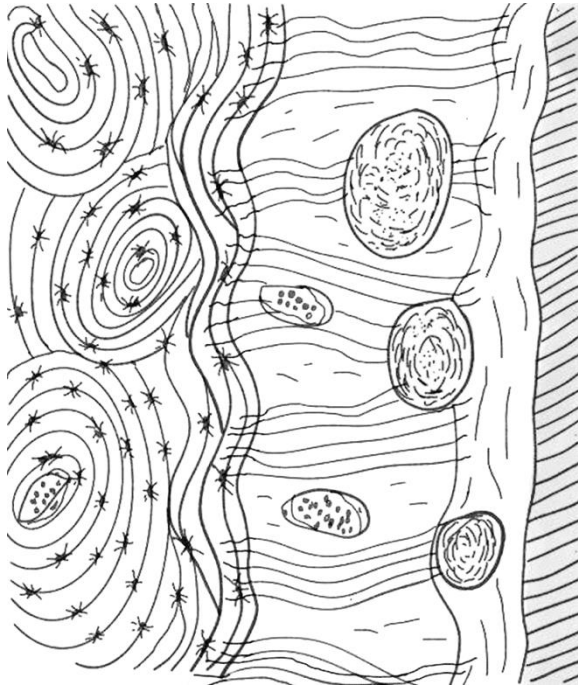
Histology slide: Longitudinal ground tooth section



Draw and indicate the following structures:

1. Dentin
2. Pulp
3. Cellular cementum
4. Acellular cementum
5. Cementocytes
6. Extracellular matrix of cementum
7. Perforating (Sharpey's fibers)
8. Tomes' granular layer
9. Dentinal tubules

Cementicles



Color the following structures, using a different color for each structure:

- dentin
- cementum
- periodontal ligament
- alveolar bone
- embedded cementicle
- attached cementicle
- free cementicle
- blood vessels

For notes:

THE LESSON IS COMPLETED

Teacher _____

« _____ »

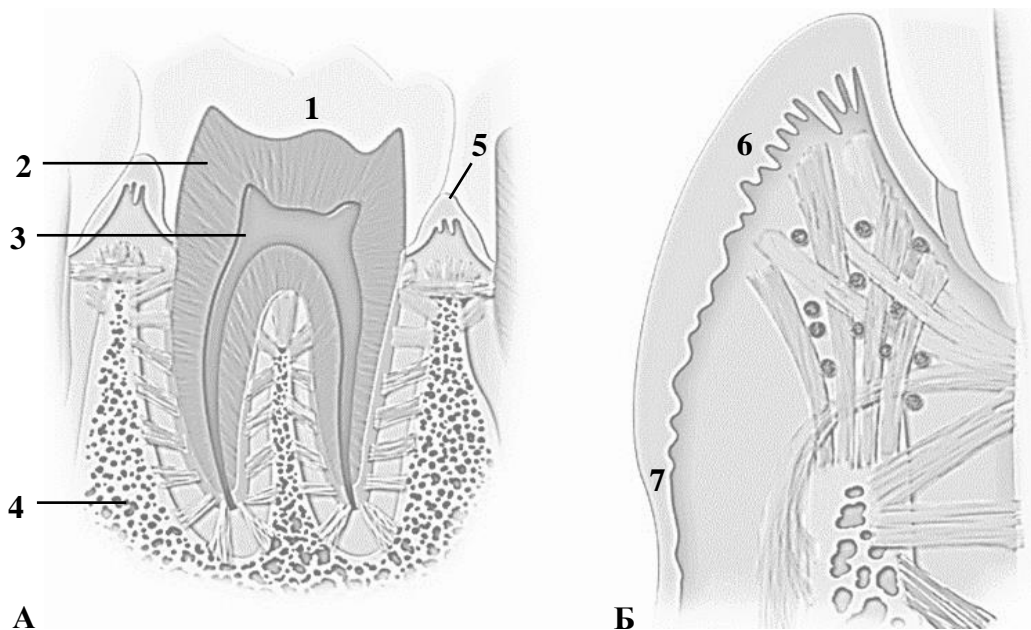
TOPIC 5
MICROSCOPIC STRUCTURE OF THE PERIODONTAL LIGAMENT,
BLOOD SUPPLY AND INNERVATION. ALVEOLAR BONE.
HISTOLOGIC CHANGES DURING TOOTH MOVEMENT.
HISTOLOGICAL ASPECTS OF ENDOSSEOUS DENTAL IMPLANTATION

Control questions:

1. Microscopic structure of the periodontal ligament. Dentoalveolar and gingival groups of fibers. Blood supply and innervation.
2. Epithelial rests in the periodontal ligament.
3. Physiological and reparative rearrangement of the desmodont.
4. The value of gingival fluid to maintain the normal state of periodontal tissues.
5. The role of periodontium in orthodontic tooth movement.
6. Alveolar bone: alveolar bone proper and supporting bone.
7. Histological changes in periodontal tissues during tooth movement.
8. Histological aspects of endosseous implantation of teeth.

MATERIAL FOR INDEPENDENT WORK

Tooth supporting apparatus



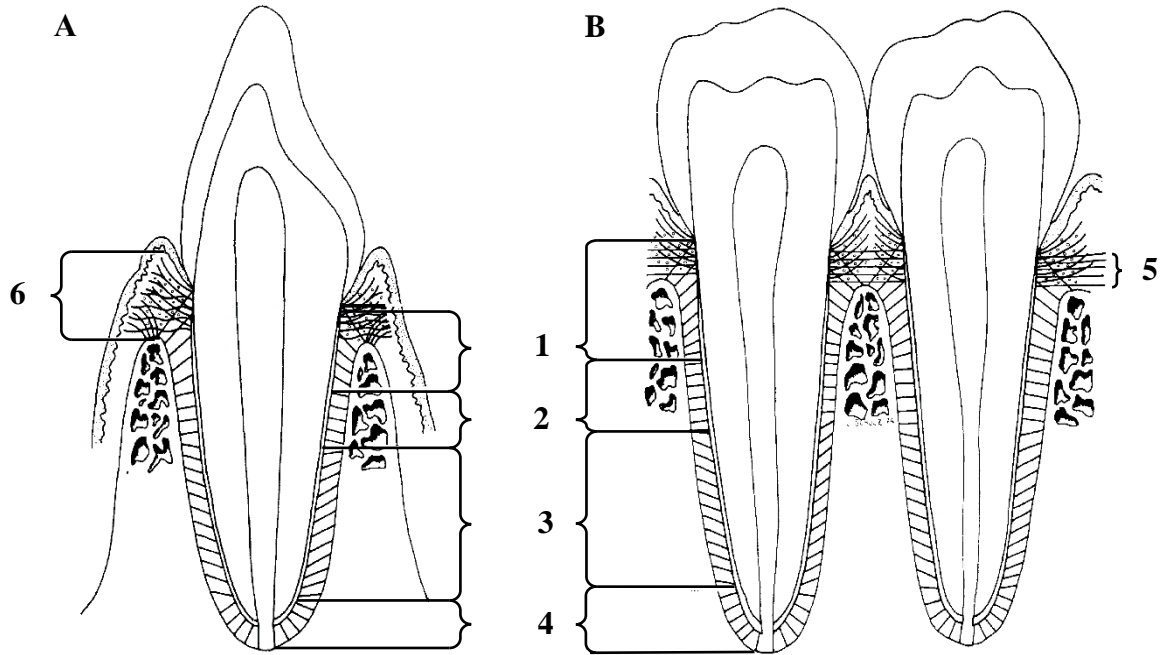
Name structures, indicated by the numbers:

1. _____
2. _____
3. Pulp cavity
4. _____
5. Interdental papilla
6. _____
7. Attached gingiva

Color the groups of periodontal ligament fibers, using a different color for each group:

- | | |
|--|---|
| <input type="checkbox"/> alveoloingival | <input type="checkbox"/> alveolar crest |
| <input type="checkbox"/> dentogingival | <input type="checkbox"/> horizontal |
| <input type="checkbox"/> dentoperiosteal | <input type="checkbox"/> oblique |
| <input type="checkbox"/> circular | <input type="checkbox"/> apical |
| <input type="checkbox"/> transseptal | <input type="checkbox"/> interradicular |

Periodontal ligament fibers



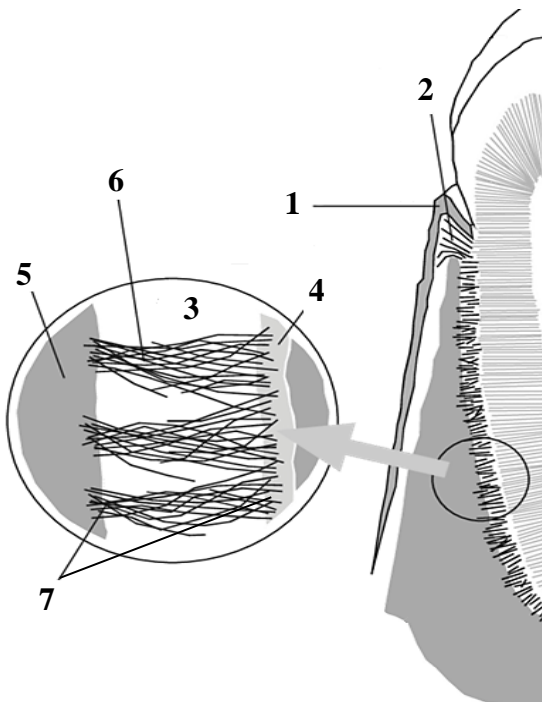
Name groups of collagen fibers, indicated by the numbers:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Color the following structures, using a different color for each structure:

- enamel
- dentin
- pulp cavity
- cementum
- alveolar bone

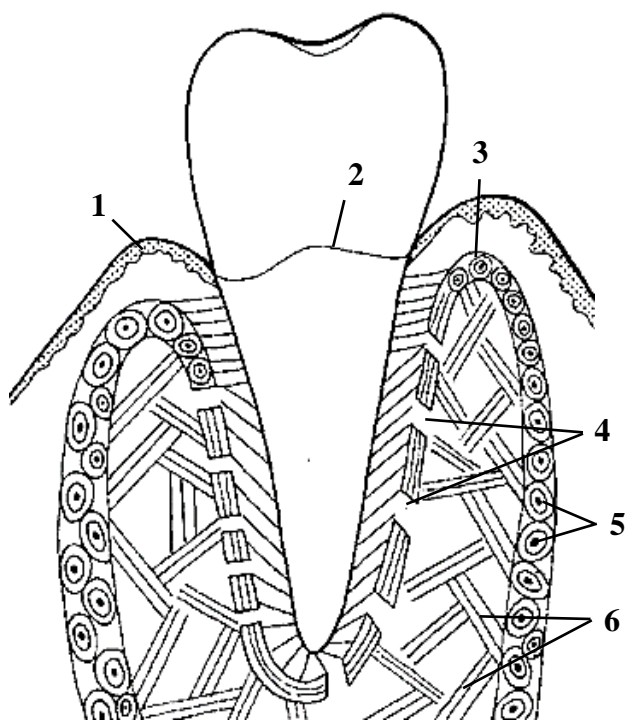
Periodontal ligament



Name structures, indicated by the numbers:

1. _____
2. _____
3. _____
4. _____
5. _____
6. Intermingling of collagen fibers
7. _____

Alveolar bone



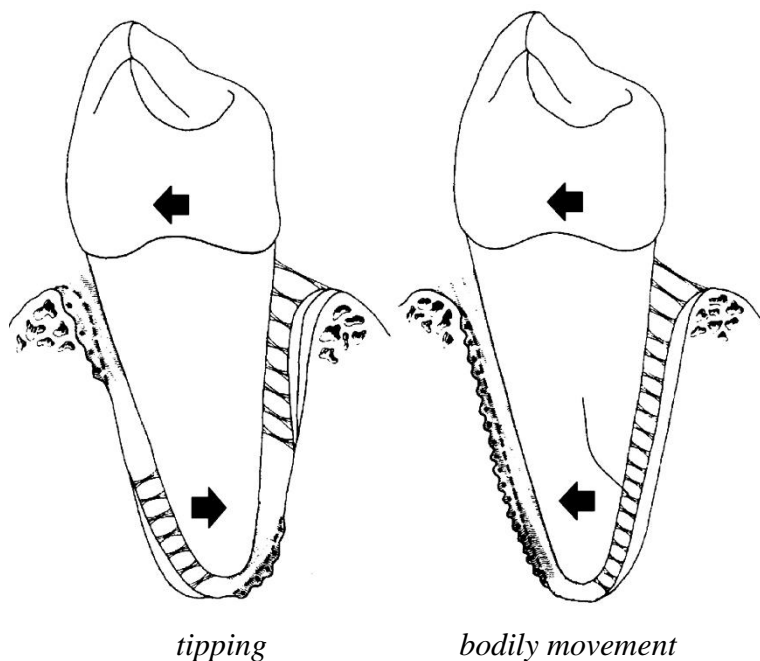
Name structures, indicated by the numbers:

1. _____
2. _____
3. Alveolar crest
4. Volkmann's canals
5. _____
6. _____

Color the following structures, using a different color for each structure:

- enamel
- cementum
- outer and inner cortical plates
- spongy bone
- alveolar bone proper
- periodontal ligament

Orthodontic tooth movement



Arrange the letters according to the location of the tension and compression zones:

- A — tension zone
- B — compression zone

THE LESSON IS COMPLETED

Teacher _____

« _____ »

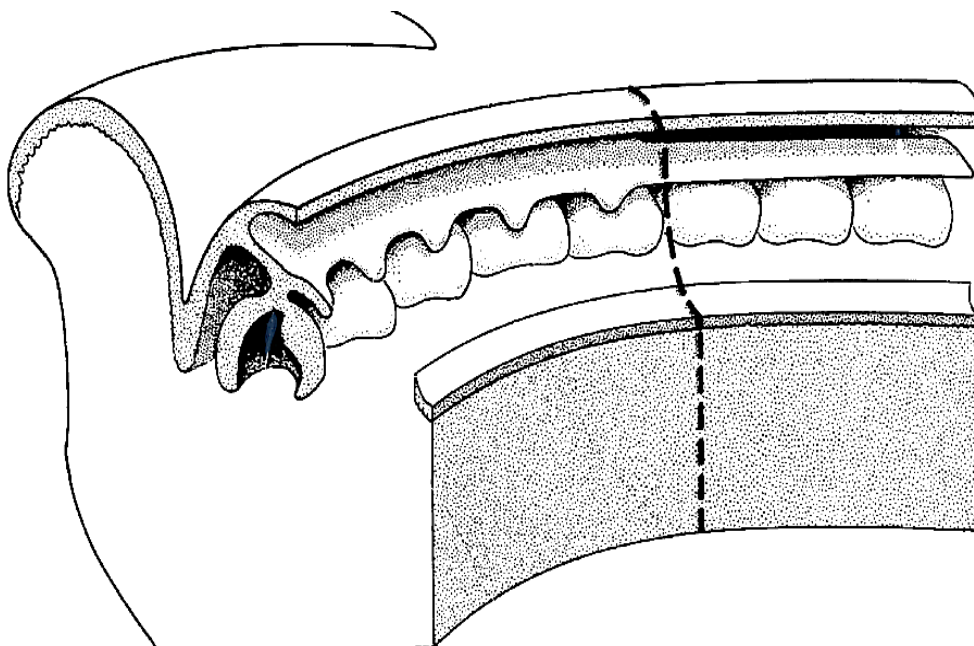
TOPIC 6
DEVELOPMENT OF THE TOOTH IN EMBRYOGENESIS.
FORMATION OF THE TOOTH GERM. MORPHOGENESIS OF THE TOOTH CROWN.
ORGANOGENESIS OF THE ROOTS OF TEETH. TOOTH ERUPTION.
CONGENITAL ANOMALIES IN THE TOOTH DEVELOPMENT

Control questions:

1. Sources of development of tooth tissues.
2. Stages of tooth development: initiation, bud, cap, and bell stages.
3. Histogenesis of dentin and enamel.
4. The development of dental pulp and periodontium.
5. Mechanisms of eruption of deciduous and permanent teeth.
6. Anomalies of the tooth structure and malformations of the teeth.
7. Clinical manifestations of violations of the early stages of tooth development.
8. Violations of dentinogenesis and enamelogenesis associated with insufficiency of alimentary factors and general diseases.

MATERIAL FOR INDEPENDENT WORK

Tooth development



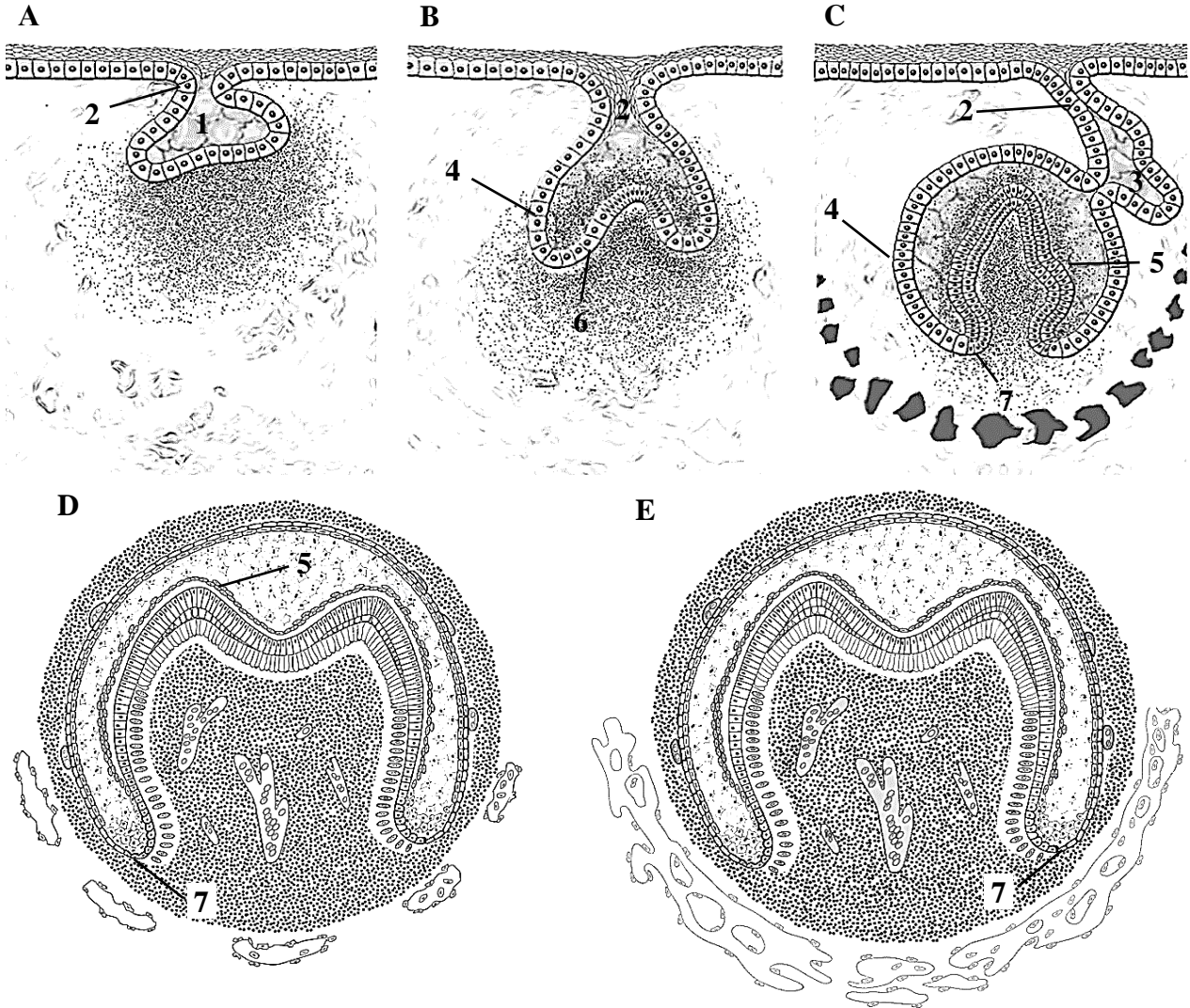
Name structures, indicated by the numbers:

1. _____ lamina
2. _____ lamina
3. Vestibule

Color the following structures, using a different color for each structure:

- germs of deciduous incisors
- germ of deciduous canine
- germs of deciduous molars
- germs of permanent molars

Development of the tooth crown



- | | |
|---------------------|------------------------------------|
| A. Bud stage | D. Late bell stage. Dentinogenesis |
| B. Cap stage | E. Late bell stage. Amelogenesis |
| C. Early bell stage | |

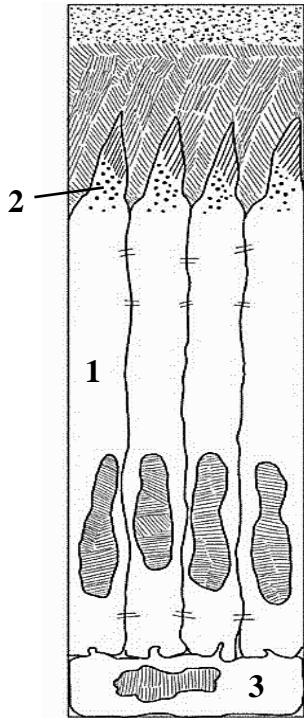
Name structures, indicated by the numbers:

1. _____
2. _____ lamina
3. _____ lamina
4. _____ epithelium
5. _____
6. _____ epithelium
7. Cervical loop

Color the following structures, using a different color for each structure:

- epithelium of the oral cavity
- dental follicle
- dental papilla
- stellate reticulum
- alveolar bone
- dentin
- enamel
- ameloblasts
- odontoblasts

Amelogenesis



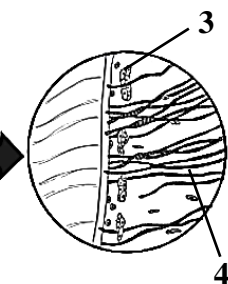
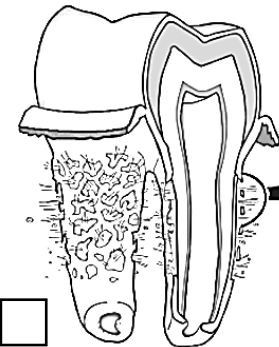
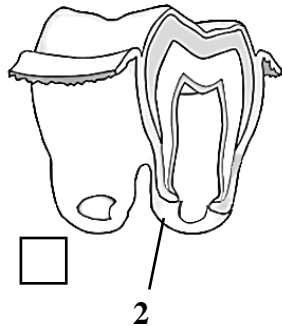
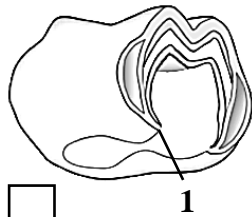
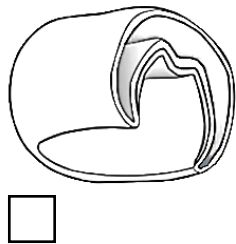
Name structures, indicated by the numbers:

1. _____
2. _____
3. _____

Color the following structures, using a different color for each structure:

- prismless enamel
- prismatic enamel

Tooth eruption



Indicate the stages of tooth development by the letters:

- A. Early bell stage
- B. Late bell stage. Dentinogenesis, amelogenesis
- C. Root sheath formation
- D. Tooth eruption
- E. Development of cementum

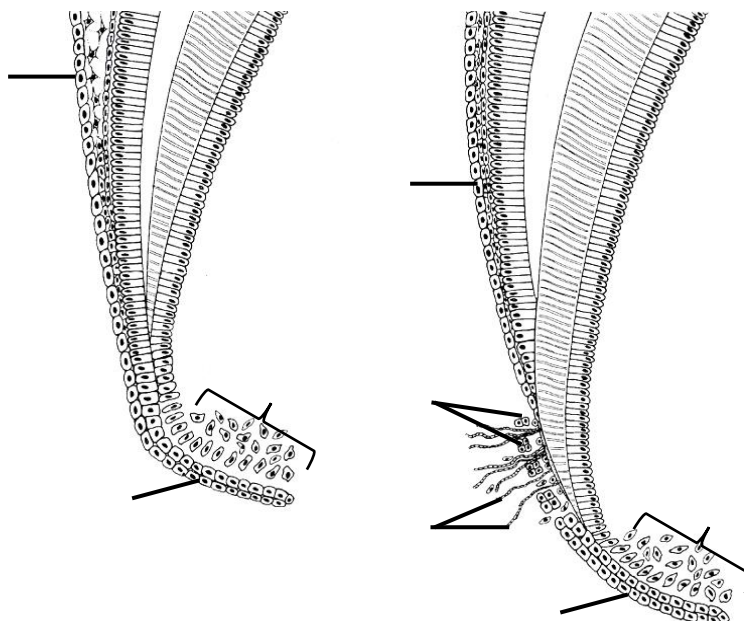
Color the following structures, using a different color for each structure:

- dentin
- enamel
- cementum
- cuticle

Name structures, indicated by the numbers:

1. _____ loop
2. _____
3. _____
4. _____

Tooth root developmet



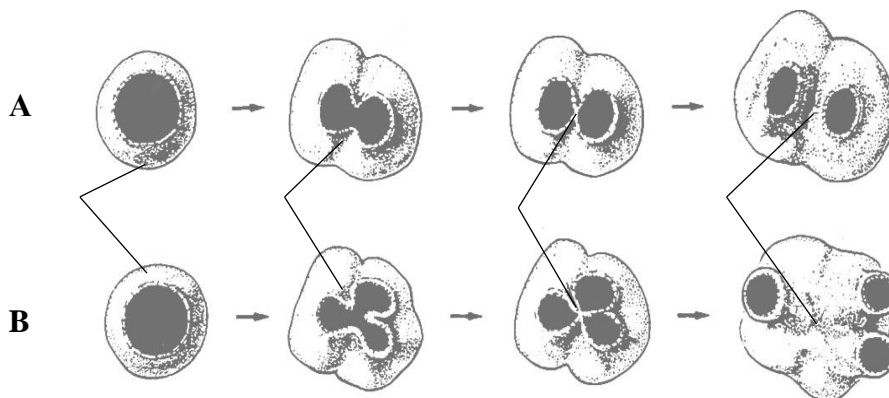
Indicate the structures by the numbers:

1. Outer enamel epithelium
2. Epithelial root sheath
3. Epithelial rests
4. Periodontal ligament fibers
5. Proliferation zone of pulp

Color the following structures, using a different color for each structure:

- dentin
- эмаль
- ameloblasts
- odontoblasts

Root formation of multirooted teeth



- A. Two roots
- B. Three roots

Indicate the structures by the numbers

1. Root trunk
2. Tongue-like extension
3. Zone of initial contact of epithelial extension
4. Furcation zone

THE LESSON IS COMPLETED

Teacher _____

« ____ » _____

TOPIC 7
MORPHOGENESIS OF THE FACE AND ORAL CAVITY. PHARYNGEAL APPARATUS,
ITS STRUCTURES AND DERIVATIVES

Control questions:

1. Formation of the stomodeum.
2. The development of the face and oral cavity, upper and lower jaws
3. The development of the palate, the formation of the nasal and oral cavities.
4. Tongue and thyroid development.
5. Structures of the pharyngeal apparatus.
6. Derivatives of pharyngeal arches, pouches, and clefts.

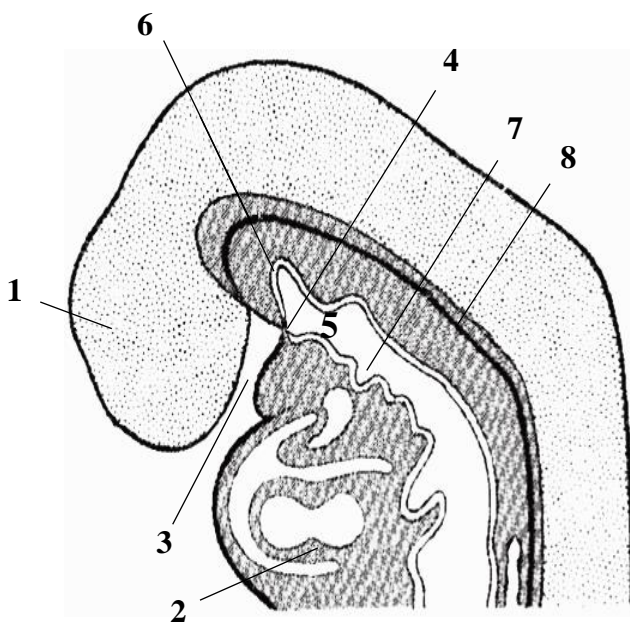
MATERIAL FOR INDEPENDENT WORK

Facial development

Fill in the table:

Facial processes (prominences)	Structures of the face and oral cavity
Frontal process	
Medial nasal process	
Lateral nasal process	
Maxillary process	
Mandibular process	

Development of the stomodeum 3,5 weeks



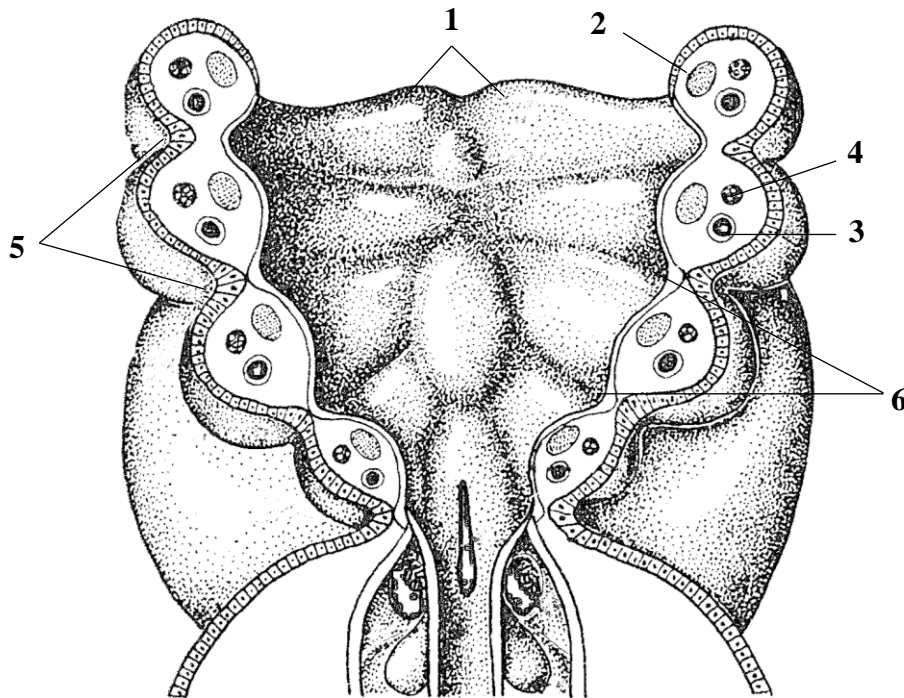
Name structures, indicated by the numbers:

1. _____
2. Heart
3. _____
4. _____ membrane
5. _____
6. Rathke's pouch
7. Thyroid diverticulum
8. Notochord

Color the following structures, using a different color for each structure:

- foregut
- endoderm

Pharyngeal apparatus. Frontal section of pharynx of 5th week embryo



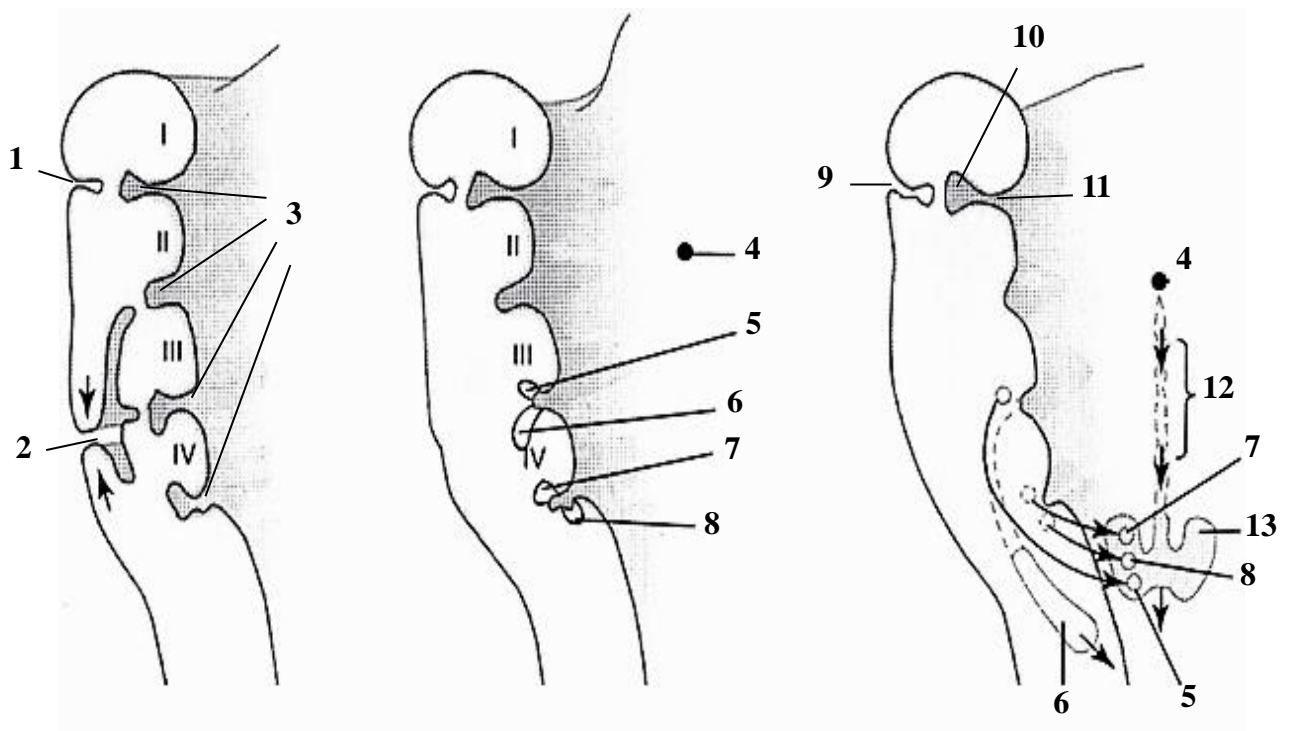
Name structures, indicated by the numbers:

1. _____ swellings
2. _____
3. Blood vessel
4. Nerve
5. Pharyngeal _____
6. Pharyngeal _____

Color the following structures, using a different color for each structure:

- ectoderm
- endoderm
- mesenchyme
- tuberculum impar
- hypobranchial eminence

Derivatives of pharyngeal clefts and pouches (5th–7th weeks)



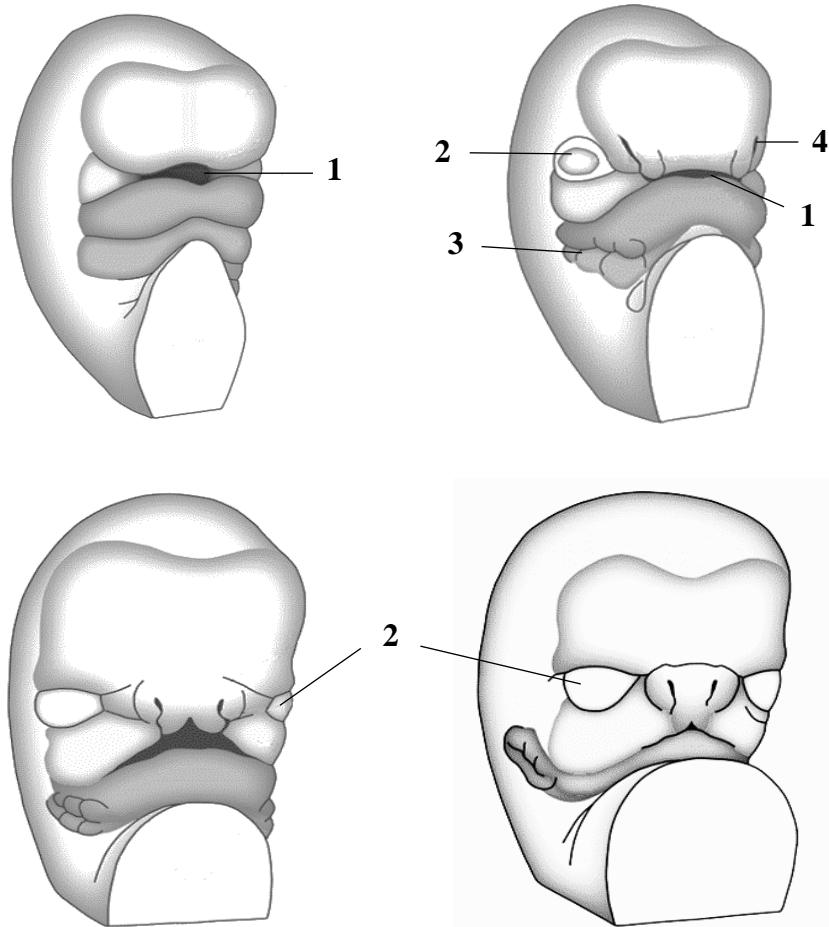
Name structures, indicated by the numbers:

1. _____
2. _____
3. _____
4. Foramen caecum
5. _____
6. Thymus
7. _____
8. _____ bodies
9. _____ meatus
10. _____ cavity
11. _____ tube
12. Thyroglossal duct
13. Thyroid

Color the following structures, using a different color for each structure:

- ectoderm
- endoderm
- mesenchyme

Development of the face (4th–7th weeks)



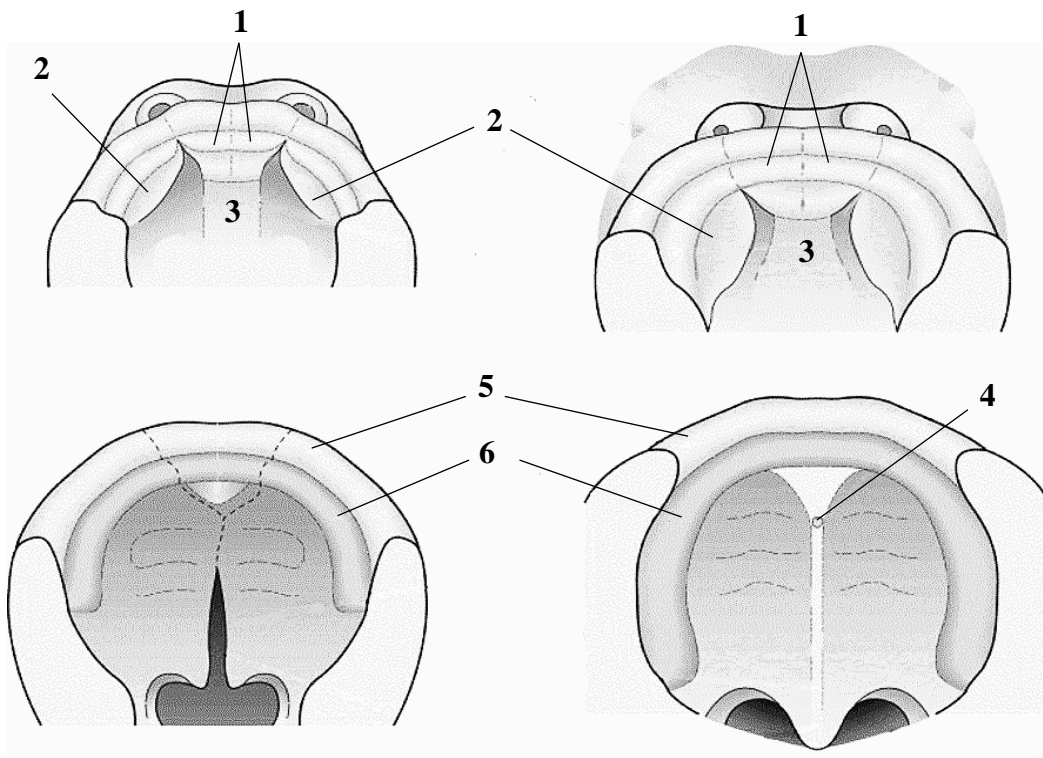
Name structures, indicated by the numbers:

1. _____ cleft
2. Eye
3. Auricular hillocks
4. _____ pit

Color the following structures, using a different color for each structure:

- frontal/frontonasal process
- maxillary processes
- mandibular arch
- hyoid arch
- heart
- medial nasal process
- lateral nasal process

Palate development (6th–12th weeks)



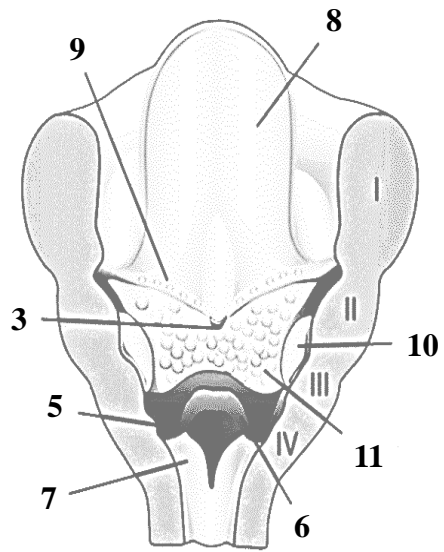
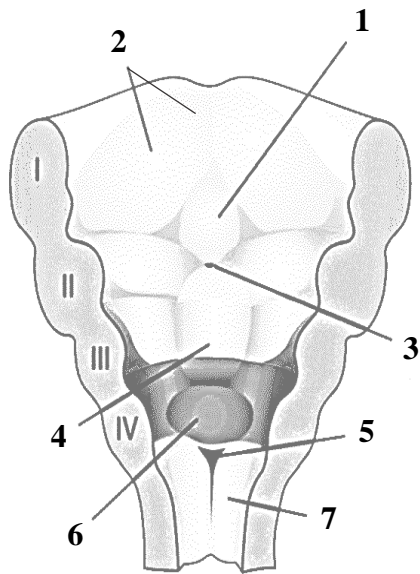
Name structures, indicated by the numbers:

1. Medial nasal processes
2. _____ shelves
3. Nasal septum
4. _____ caecum
5. Upper lip
6. Gingiva

Color the following structures, using a different color for each structure:

- primary palate
- secondary palate

Tongue development (4th–10th weeks)



Name structures, indicated by the numbers:

1. Tuberculum _____
2. _____ swellings
3. Foramen _____
4. Hypobranchial _____
5. Laryngeal opening
6. Epiglottis
7. Larynx
8. Body of tongue
9. _____ sulcus
10. Palatine tonsil
11. Base of tongue

Color the derivatives of pharyngeal arches, using a different color for each:

- I arch and its derivatives
- II arch and its derivatives
- III arch and its derivatives

THE LESSON IS COMPLETED

Teacher _____

« _____ » _____

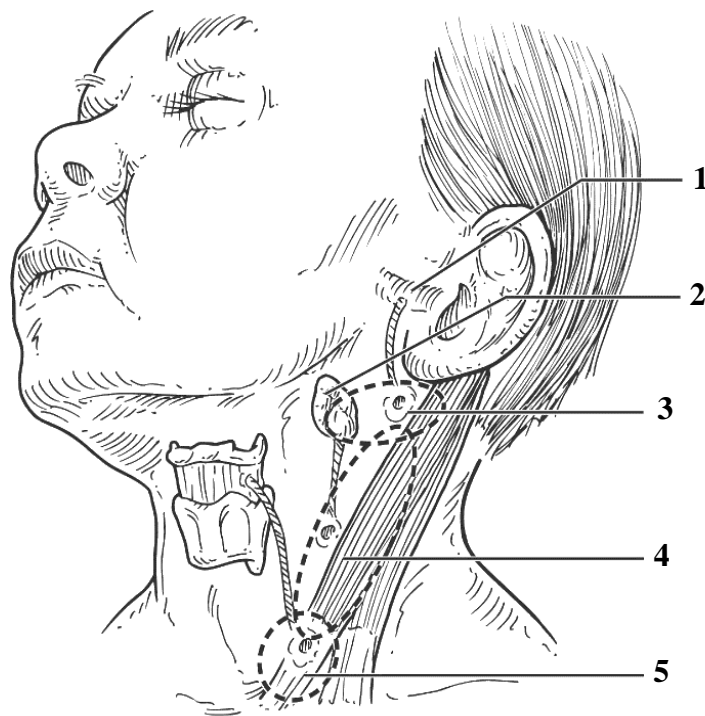
TOPIC 8
CONGENITAL MALFORMATIONS OF THE FACE AND NECK.
PREVENTION OF CONGENITAL PATHOLOGY

Control questions:

1. The significance of external risk factors for the occurrence of congenital malformations.
2. Endogenous factors as the cause of malformations.
3. Congenital dentomaxillofacial anomalies. Influence of defects of the maxillofacial region on the development and health of children.
4. Anomalies in the development of the face: macrostomia, microstomia, cleft lip, cleft palate.
5. Congenital neck cysts.
6. Congenital malformations associated with anomalies in the development of pharyngeal arches.

MATERIAL FOR INDEPENDENT WORK

Congenital neck cysts



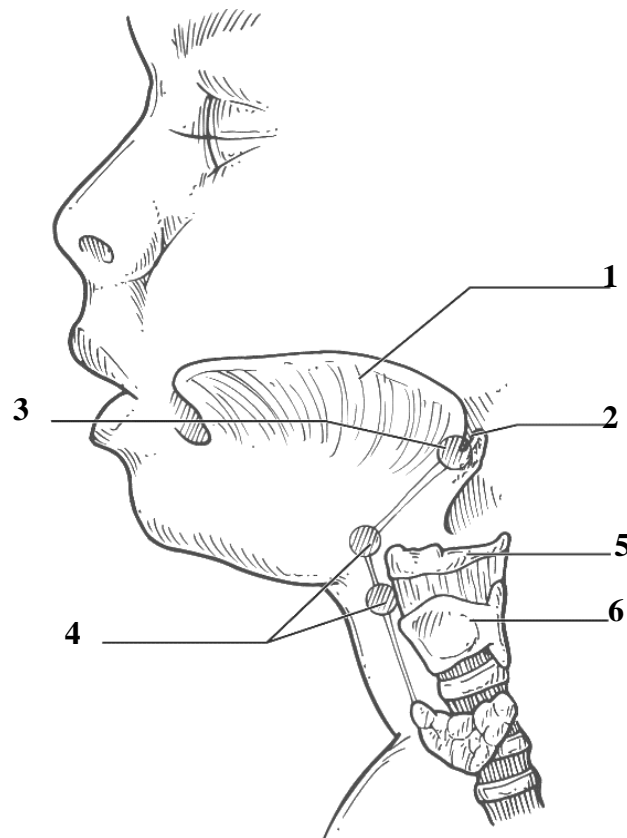
Name structures, indicated by the numbers:

1. _____ meatus
2. _____ tonsil
3. _____ from ___ branchial cleft
4. _____ from ___ branchial cleft
5. _____ from ___ branchial cleft

Color the following structures, using a different color for each structure:

- sternocleidomastoid muscle
- hyoid bone
- thyroid cartilage

Thyroid development



Name structures, indicated by the numbers:

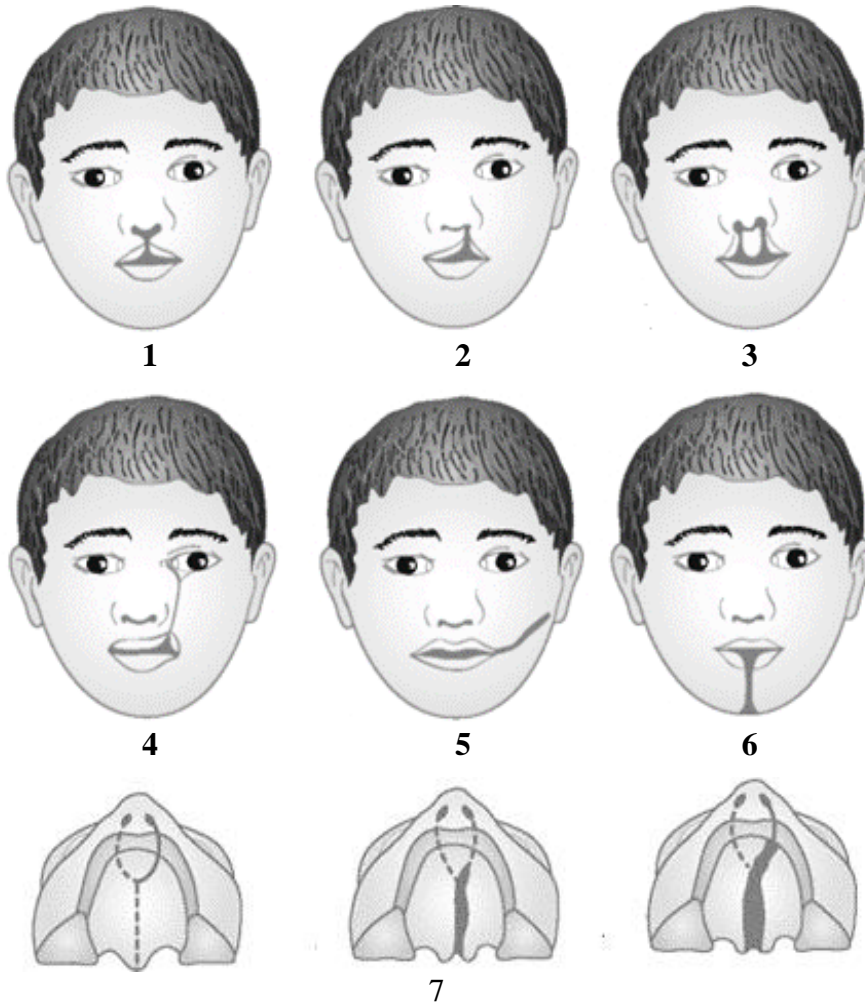
1. _____
2. _____
3. Lingual thyroid
4. Ectopic thyroid
5. _____
6. _____ cartilage

Color the following structures, using a different color for each structure:

thyroglossal duct

thyroid

Congenital malformations of the face



Name malformations, indicated by the numbers:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

THE LESSON IS COMPLETED

Teacher _____

« ____ » _____

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