

# DENT-1311: DENTAL ANATOMY, HISTOLOGY & EMBRYOLOGY

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## Cuyahoga Community College

**Viewing: DENT-1311 : Dental Anatomy, Histology & Embryology**

**Board of Trustees:**

March 2022

**Academic Term:**

Fall 2022

**Subject Code**

DENT - Dental Hygiene

**Course Number:**

1311

**Title:**

Dental Anatomy, Histology & Embryology

**Catalog Description:**

Study of the form, function and comparative anatomy of primary and permanent teeth, tooth numbering, and dentition periods. Embryologic development of the face, neck, orofacial structures and teeth. Histologic study of the gingiva, oral mucosa and attachment apparatus.

**Credit Hour(s):**

2

**Lecture Hour(s):**

2

## Requisites

**Prerequisite and Corequisite**

Concurrent enrollment in DENT-1300 Preventive Oral Health Services I.

## Outcomes

**Course Outcome(s):**

Identify all permanent/succedaneous and primary/deciduous teeth.

**Objective(s):**

1. Identify each permanent tooth on a slide, picture, student partner or from model teeth during a written or an identification practical examination.
2. Compare the anatomy of the permanent and deciduous teeth including size, pulp cavities, color and shape.
3. Correlate the eruption of primary and permanent teeth with the approximate age level of a patient.
4. Utilize correct terminology to identify a line angle, point angle, third of a tooth or root surface on a tooth.
5. Utilize knowledge of eruption dates to assist with the identification of a permanent or primary tooth in the oral cavity.
6. Utilize the Dentition-Arch-Quadrant-Tooth, Universal, Palmer Notation and Federation Dentaire Internationale systems to identify both permanent and primary teeth.
7. Describe the types of teeth located in each sextant, quadrant or arch of the permanent and primary dentitions.
8. Identify all landmarks of the anterior and posterior teeth on slides, pictures, and models of teeth.
9. Describe the morphologic features of incisors, canines, premolars, and molars for the permanent dentition.
10. Describe the curvatures of the teeth and relate them to the overall health of the dentition.
11. Describe basic morphologic features of incisors, canines, and molars for the deciduous dentition.
12. Identify embrasure spaces as facial, lingual/palatal, incisal/occlusal, or gingival.

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**Course Outcome(s):**

Describe the process of odontogenesis as it relates to the development of the dentitions.

**Objective(s):**

1. Outline the four stages of odontogenesis.
  2. Summarize the types of cells involved in the stages of odontogenesis.
  3. Describe the process of apposition and maturation for each tooth tissue.
  4. List the organic and inorganic components of each tooth tissue.
  5. Outline the microscopic features of each tooth tissue.
  6. Compare and contrast the phases of development and histologic features of enamel, dentin and pulp.
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**Course Outcome(s):**

Identify the types and locations of oral mucosa.

**Objective(s):**

1. Identify three types of oral mucosa and describe the histologic and microscopic features.
  2. Describe the specific types of epithelium.
  3. Compare the types of papillae located on the tongue.
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**Course Outcome(s):**

Identify the histologic components of the attachment apparatus; cementum, alveolar bone, and the periodontal ligament.

**Objective(s):**

1. Describe the types of cementum and alveolar bone.
  2. Discuss the periodontium and describe the properties of each of its components.
  3. Describe the development of the periodontium.
  4. Indicate and discuss the microscopic features of the periodontium.
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**Course Outcome(s):**

Explain the histologic components of the salivary glands, lymph nodes, nasal cavity mucosa, and paranasal sinus mucosa and their processes of development.

**Objective(s):**

1. List the components of saliva and their function.
  2. Differentiate between serous, mucous and mixed salivary glands.
  3. Compare and contrast major vs. minor salivary glands.
  4. Discuss the difference between an exocrine and an endocrine gland.
  5. Explain the histology and development of the thyroid gland.
  6. Explain the histology and development of the lymph nodes and tonsillar tissues.
  7. Discuss the histology of the nasal cavity and paranasal sinuses.
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**Course Outcome(s):**

Utilize knowledge of root morphology during instrumentation to assist with removal of accretions and to prevent damage to tooth structure.

**Objective(s):**

1. Identify the location and curvature of the cements-enamel junction on all permanent teeth.
  2. Identify concavities and grooves on all permanent teeth.
  3. Memorize the average length of the roots of all permanent teeth.
  4. Identify the location of furcations on all multi-rooted teeth.
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**Course Outcome(s):**

Explain the process of prenatal development of the face, neck, and orofacial structures.

**Objective(s):**

1. Outline the three periods of prenatal development and describe major events that occur in each period.
  2. Identify the embryonic structures in the development of the face, their origin, and future tissue manifestations.
  3. Describe the development of the palate including primary, secondary, and final palate formation.
  4. Explain the steps and structures involved in the development of the nasal cavity and nasal septum.
  5. Discuss the development of the tongue including the time period and sections involved.
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**Methods of Evaluation:**

1. Quizzes
2. Examinations
3. Mini case and questions development
4. Worksheets and Activity Sheets
5. Professionalism

**Course Content Outline:**

1. Terminology
  - a. Maxilla
  - b. Mandible
  - c. Primary Dentition
  - d. Permanent Dentition
  - e. Alveolar Process
  - f. Alveolus
  - g. Anatomic Crown and Root
  - h. Clinical Crown and Root
  - i. Cementoenamel Junction
  - j. Apex
  - k. Eruption
  - l. Lobes
  - m. Coalescence
  - n. Mamelons
2. Functions of Teeth
  - a. Mastication
  - b. Speech
  - c. Appearance
  - d. Protection
3. Identification of Tooth Tissues
  - a. Enamel
  - b. Dentin
  - c. Pulp
  - d. Cementum
4. Types of Teeth
  - a. Incisors
  - b. Canines
  - c. Premolars
  - d. Molars
5. Surfaces of Teeth
  - a. Facial
  - b. Labial
  - c. Buccal
  - d. Lingual
  - e. Palatal
  - f. Distal
  - g. Mesial
  - h. Occlusal
  - i. Incisal
6. Divisions of the Crown into Thirds
  - a. Mesiodistal thirds
  - b. Faciolingual thirds
  - c. Cervico-occlusal/incisal thirds
7. Divisions of the Root into Thirds
  - a. Cervicoapical thirds
  - b. Mesiodistal thirds
  - c. Faciolingual thirds
8. Line Angles

- a. Anterior Teeth
    - i. Mesiolabial
    - ii. Distolabial
    - iii. Mesiolingual
    - iv. Distolingual
    - v. Linguoincisal
    - vi. Labioincisal
  - b. Posterior Teeth
    - i. Mesiobuccal
    - ii. Distobuccal
    - iii. Mesiolingual
    - iv. Distolingual
    - v. Mesio-occlusal
    - vi. Disto-occlusal
    - vii. Bucco-occlusal
    - viii. Linguo-occlusal
9. Point Angles
- a. Anterior Teeth
    - i. Mesiolabioincisal
    - ii. Distolabioincisal
    - iii. Mesiolinguoincisal
    - iv. Distolinguoincisal
  - b. Posterior Teeth
    - i. Mesiobucco-occlusal
    - ii. Distobucco-occlusal
    - iii. Mesiolinguo-occlusal
    - iv. Distolinguo-occlusal
10. Dentition Periods
- a. Primary/Deciduous
  - b. Permanent/Succedaneous
  - c. Mixed Dentition
  - d. Number and Types of Teeth
  - e. Eruption Dates
11. Divisions of the Oral Cavity
- a. Quadrants
  - b. Sextants
  - c. Arches
12. Teeth Numbering/Coding Systems
- a. DAQT (Dentition, Arch, Quadrant, Tooth)
  - b. Universal
  - c. Palmer Notation
  - d. Federation Dentaire Internationale
13. Curvatures of Teeth
- a. Proximal Contact Areas
  - b. Interproximal Spaces
  - c. Embrasure Spaces
  - d. Height of Contours
  - e. Cementoenamel Junction Curvatures
  - f. Self-Cleansing Qualities
  - g. Problems from Incorrect Curvature
14. Eruption Periods
- a. Exfoliation
  - b. Primary Teeth
  - c. Permanent Teeth
  - d. Additional Terms
15. Permanent Incisors
- a. Eruption Dates
  - b. Position and Function

- c. Long Axis from facial, mesial, distal and lingual views
  - d. Crown and Root Morphology
  - e. Determining Right from Left
  - f. Determining Mandibular from Maxillary
  - g. Identification
16. Permanent Canines
- a. Eruption Dates
  - b. Position and Function
  - c. Long Axis from facial, mesial, distal and lingual views
  - d. Crown and Root Morphology
  - e. Determining Right from Left
  - f. Determining Mandibular from Maxillary
  - g. Identification
17. Permanent Premolars
- a. Eruption Dates
  - b. Position and Function
  - c. Long Axis from facial, mesial, distal and lingual views
  - d. Crown and Root Morphology
  - e. Determining Right from Left
  - f. Determining Mandibular from Maxillary
  - g. Identification
18. Permanent Molars
- a. Eruption Dates
  - b. Position and Function
  - c. Long Axis from facial, mesial, distal and lingual views
  - d. Crown and Root Morphology
  - e. Determining Right from Left
  - f. Determining Mandibular from Maxillary
  - g. Identification
19. Primary Dentition
- a. Eruption
  - b. Position and Function
  - c. Numbering
  - d. Morphology
  - e. Clinical Appearance
  - f. Compare and Contrast Deciduous and Permanent Dentitions
20. Three Periods of Prenatal Development
- a. Preimplantation Period
  - b. Embryonic Period
  - c. Fetal Period
21. Development of the Face
- a. Stomodeum and Oral Cavity Formation
  - b. Mandibular Arch and Lower Face Formation
  - c. Frontonasal Process and Upper Face Formation
  - d. Maxillary Process and Midface Formation
  - e. Upper and Lower Lip Formation
22. Development of the Neck
- a. Primitive Pharynx Formation
  - b. Branchial Apparatus Formation
  - c. Branchial Groove and Membrane Formation
  - d. Pharyngeal Pouch Formation
23. Palatal Development
- a. Primary Palate Formation
    - i. Hard Palate
  - b. Secondary Palate Formation
    - i. Soft Palate
    - ii. Median Palatine Raphae and Rugae
  - c. Completion of the Palate

24. Nasal Cavity and Septum Development
25. Tongue Development
  - a. Body of Tongue Formation
  - b. Base of Tongue Formation
  - c. Completion of Tongue Formation
26. Development of the Dentitions
  - a. Initiation Stage
  - b. Bud Stage
  - c. Cap Stage
    - i. Enamel organ
    - ii. Enamel knot
    - iii. Dental papilla
    - iv. Dental sac
    - v. Tooth germ
    - vi. Successional dental lamina
    - vii. Succedaneous
    - viii. Non-succedaneous
    - ix. Dental lamina
  - d. Bell Stage
    - i. Outer enamel epithelium
    - ii. Inner enamel epithelium
    - iii. Stellate reticulum
    - iv. Stratum intermedium
27. Stages of Apposition and Maturation
  - a. Formation of Preameloblasts
  - b. Formation of Odontoblasts and Dentin Matrix
  - c. Formation of Ameloblasts, Dentinoenamel Junction and Enamel Matrix
28. Root Development
  - a. Root Dentin Formation
  - b. Cementum and Pulp Formation
  - c. Multirooted teeth
29. Enamel
  - a. Mature Enamel
    - i. Organic
    - ii. Inorganic
  - b. Apposition of Enamel Matrix
    - i. Amelogenesis
    - ii. Ameloblasts
    - iii. Tomes' process
  - c. Maturation of Enamel Matrix
    - i. Reduced enamel epithelium
    - ii. Nasmyth's membrane
  - d. Microscopic Features of Mature Enamel
    - i. Enamel rods
    - ii. Interprismatic region
    - iii. Lines of Retzius
    - iv. Enamel spindles
    - v. Enamel tufts
    - vi. Enamel lamellae
30. Dentin
  - a. Apposition of Dentin Matrix
    - i. Dentinogenesis
    - ii. Odontoblasts
    - iii. Inorganic and organic composition
  - b. Maturation of Dentin
    - i. Globular dentin
    - ii. Interglobular dentin
  - c. Components of Mature Dentin

- i. Dentinal tubules
      - ii. Dentinal fluid
    - d. Types of Dentin
      - i. Peritubular
      - ii. Intertubular
      - iii. Mantle
      - iv. Circumpulpal
      - v. Primary
      - vi. Secondary
      - vii. Tertiary
    - e. Microscopic Features of Mature Dentin
      - i. Imbrication lines of Von Ebner
      - ii. Contour lines of Owen
      - iii. Tomes' granular layer
    - f. Aging and Dentin
      - i. Sclerosis of tubules
      - ii. Obliteration of tubules
      - iii. Dentinal hypersensitivity
      - iv. Internal and external resorption
- 31. Pulp
  - a. Anatomy of the Pulp
    - i. Pulp chamber
    - ii. Coronal pulp
    - iii. Pulp horns
    - iv. Radicular pulp
    - v. Apical foramen
    - vi. Accessory canals
    - vii. Hertwig's epithelial root sheath
  - b. Microscopic Features of the Pulp
    - i. Connective tissue
    - ii. Fibroblasts
    - iii. Odontoblasts
    - iv. Mesenchyme
    - v. Blood cells
    - vi. Fibers
      - 1. Collagen
      - 2. Reticular
    - vii. Lymphatics
    - viii. Pulp stones
  - c. Microscopic Zones in the Pulp
    - i. Odontoblastic layer
    - ii. Cell-free zone
    - iii. Cell-rich zone
    - iv. Pulpal core
- 32. Cementum
  - a. Composition of Inorganic and Organic
  - b. Development of Cementum
    - i. Dental sac
    - ii. Hertwig's epithelial root sheath
    - iii. Cementogenesis
    - iv. Dentinocemental junction
  - c. Microscopic Appearance
    - i. Sharpey's fibers
    - ii. Lacuna
    - iii. Canaliculi
  - d. Types of Cementum
    - i. Accellular
    - ii. Cellular
  - e. Clinical Considerations about Cemental Formation

- i. Cementicles
  - ii. Cemental spurs
  - iii. Hypercementosis
- 33. Alveolar Bone
  - a. Inorganic and Organic Composition
  - b. Anatomy of the Jaws
    - i. Basal bone
    - ii. Alveolar bone proper
    - iii. Lamina dura
    - iv. Alveolar crest
    - v. Cortical bone
    - vi. Trabecular bone
    - vii. Interdental septum
    - viii. Interradicular septum
  - c. Development of the Jaws
    - i. Maxillary arch
    - ii. Mandibular arch
    - iii. First branchial arch
- 34. Periodontal Ligament
  - a. Components
    - i. Cells
      - 1. Blood
      - 2. Endothelium
      - 3. Cementoblasts
      - 4. Osteoblasts
      - 5. Osteoclasts
      - 6. Odontoclasts
      - 7. Fibroblasts
      - 8. Epithelial rests of Malassez
  - b. Development
- 35. Oral Mucosa
  - a. Microscopic Appearance
    - i. Lining mucosa
    - ii. Masticatory
    - iii. Specialized
  - b. Epithelium
    - i. Nonkeratinized stratified squamous
    - ii. Orthokeratinized stratified squamous
    - iii. Parakeratinized stratified squamous
    - iv. Types of cells
      - 1. Epithelial
      - 2. Melanocyte
      - 3. Langerhans cell
      - 4. Granstein cell
      - 5. Merkel cell
    - v. Lamina propria of oral mucosa
  - c. Histologic Features
    - i. Labial mucosa
    - ii. Buccal mucosa
    - iii. Alveolar mucosa
    - iv. Ventral surface of the tongue
    - v. Floor of the mouth
    - vi. Soft palate
    - vii. Hard palate
    - viii. Attached gingiva
  - d. Turnover Time, Repair and Aging
- 36. Tongue
  - a. Body
  - b. Base



- c. Papillae
  - i. Filiform
  - ii. Fungiform
  - iii. Foliate
  - iv. Circumvallate
- 37. Pigmentation of Oral Mucosa
  - a. Melanin
- 38. Salivary Glands
  - a. Development of Salivary Glands
  - b. Exocrine versus Endocrine Glands
  - c. Major versus Minor Salivary Glands
  - d. Saliva
  - e. Histology
    - i. Secretory cells and acini
      - 1. Mucous cells
      - 2. Serous cells
      - 3. Myoepithelial cells
- 39. Lymphatics
  - a. Purpose
  - b. Histology of Lymph Nodes
  - c. Development
    - i. Tonsillar tissue
- 40. Nasal Cavity, Paranasal Sinuses & Thyroid Gland
  - a. Histology
  - b. Development

## Resources

Blue, C. *Darby's Comprehensive Review of Dental Hygiene*. 9th ed. Philadelphia: Elsevier, 2020.

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Brand, R. and Isselhard, D. *Anatomy of Orofacial Structures*. 8th ed. Canada: Elsevier, 2019.

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Fehrenbach, M. & Popowics, T. *Illustrated Dental Embryology, Histology and Anatomy*. 5th Ed. St. Louis: Elsevier, 2021.

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Fehrenbach, M. *Student Workbook for Illustrated Dental Embryology, Histology and Anatomy*. 5th Ed. St. Louis: Elsevier, 2020.

---

Gehrig, J., Sroda, R. & Saccuzzo, D. *Fundamentals of Periodontal Instrumentation & Advanced Root Instrumentation*. 8th Edition. Jones and Bartlett Learning, 2020.

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Schneid, R. & Weiss, G. *Woelfel's Dental Anatomy*. 9th ed. Jones and Bartlett Learning, 2017.

## Resources Other

1. Set of plastic anatomy teeth
2. Typodont purchased by students
3. App: Bonebox-Dental
4. [www.dentalcare.com](http://www.dentalcare.com) (<http://www.dentalcare.com/>) *Procter & Gamble Student-Professional area*
5. [www.ohiolink.edu](http://www.ohiolink.edu) (<http://www.ohiolink.edu>) *OhioLINK central library catalog*
6. [https://owl.purdue.edu/owl/avoiding\\_plagiarism/plagiarism\\_faq.html](https://owl.purdue.edu/owl/avoiding_plagiarism/plagiarism_faq.html) ([https://owl.purdue.edu/owl/avoiding\\_plagiarism/plagiarism\\_faq.html](https://owl.purdue.edu/owl/avoiding_plagiarism/plagiarism_faq.html)) *Online writing lab/plagiarism info*
7. [www.andyfuturesdh.com](http://www.andyfuturesdh.com) (<http://www.andyfuturesdh.com>) *National Board Study Assistance, student info*
8. [www.simplyteeth.com](http://www.simplyteeth.com) (<http://www.simplyteeth.com>) *Information on eruption + general dental information*
9. [www.thecochranelibrary.com](http://www.thecochranelibrary.com) (<http://www.thecochranelibrary.com>) *Provides up-to-date information about the effects of healthcare*

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