

Darby: Mosby's Comprehensive Review of Dental Hygiene, 7th Edition

Chapter 02: Histology and Embryology

Chapter Review - Questions

Answers and rationales to chapter review questions are available on this text's accompanying Evolve site. See inside front cover for details.

Use Case A to answer questions 1 to 8.

CASE A

A 28-year-old client has a mandibular labial oral piercing. On oral assessment, she exhibits a palpable nodule in the area of the piercing. She states that she noticed the "little lump" about a year after she received the piercing. She received the mandibular labial and tongue piercings approximately 2 years ago. She does not remember biting her lip. She has come to the dental office because she chipped the enamel of her mandibular central incisor and she is experiencing dentinal hypersensitivity. epithelium.

- 1. The nodule in the area of the labial piercing is diagnosed as a cyst. A cyst is all of the following EXCEPT:**
 - a. An abnormal pathologic sac
 - b. A cavity lined by epithelial tissue
 - c. Enclosed by connective tissue
 - d. Diagnosed on the basis of histologic appearance and location
 - e. Composed entirely of connective tissue
- 2. The client habitually removed the labial piercing during the first year after she received the piercing. The layer of stratified squamous epithelium that constantly undergoes mitosis was pushed down into the underlying connective tissue. These epithelial cells served as the source of cyst formation. In which layer of the epidermis are cells undergoing mitosis most likely to be seen?**
 - a. Stratum basal
 - b. Stratum lucidum
 - c. Stratum corneum
 - d. Stratum spinosum
 - e. Stratum granulosum
- 3. The sensitivity of the client's mandibular incisors is MOST likely related to:**
 - a. Fluid entering the sulcular epithelium
 - b. Fluid entering the rodless enamel
 - c. Fluid entering the dentinal tubules
 - d. Fluid entering the lacuna of the cementum
- 4. Of the following tissues, which one or more have nerve innervations?**
 - a. Dentin and enamel
 - b. Enamel and cementum

- c. Pulp and periodontal ligament
 - d. Dentin, pulp and periodontal ligament
 - e. Enamel, dentin, pulp and periodontal ligament
5. **Because of the proximity of odontoblastic cell bodies to nerve terminal endings in the tooth, clinical exposure of dentin may result in sensitivity. What is the location of the odontoblastic bodies?**
- a. Dentin
 - b. Pulp
 - c. Enamel
 - d. Cementum
 - e. Periodontal ligament
6. **Some loss of enamel is evident on the lingual aspects of the client's maxillary central incisors because of their contact with the lingual piercing. The tooth structure loss that occurs from pathologic wear of teeth by foreign substance is called:**
- a. Attrition
 - b. Erosion
 - c. Abfraction
 - d. Abrasion
 - e. Dental caries
7. **Bone loss is noted on the periapical radiograph of the mandibular incisors. The crest of the alveolar bone is usually apical to the cemento-enamel junction (CEJ) by:**
- a. The CEJ
 - b. 0.75 to 1.49 mm
 - c. 3 mm to 4 mm
 - d. 4 mm to 5 mm
 - e. 0.5 mm
8. **When a cyst shows up radiographically, it has a well-defined border; this cyst of the mandibular labial tissue will show up radiographically.**
- a. Both statements are true
 - b. Both statements are false
 - c. The first statement is true; the second is false
 - d. The first statement is false; the second is true

Use Case B to answer questions 9 to 23.

CASE B

A 48-year-old woman is being treated by the dental hygienist for the first time. She states that she is in very good health. Clinical examination reveals generalized bleeding of the gingiva with generalized rolled margins, bulbous interdental papillae, and no signs of inflammation of the attached gingiva. A 1-mm zone of attached gingiva on the facials of the mandibular central incisors and a class I furcation on the facial of tooth #30 are noted. She has a 7-mm clinical attachment loss reading on the facial of #30. Radiographs do not reveal the furcation, but a

radiopacity that is continuous with the coronal enamel and extends into the furcation is noted. No other attachment loss or bone loss is noted throughout the mouth. Occlusal evaluation reveals no premature contacts or signs of tooth wear.

- 9. The tissue lining of an unhealthy gingival sulcus consists of:**
 - a. Keratinized epithelium with rete pegs
 - b. Keratinized epithelium without rete pegs
 - c. Nonkeratinized epithelium with rete pegs
 - d. Nonkeratinized epithelium without rete pegs
 - e. Parakeratinized epithelium with rete pegs

- 10. The bottom of the gingival sulcus is marked by the:**
 - a. Marginal gingiva
 - b. Junctional epithelium
 - c. Alveolar crest
 - d. Sulcular epithelium
 - e. Periodontal ligament

- 11. Which of the following tissues have little or no keratinization?**
 - a. Attached gingiva
 - b. Interdental papilla
 - c. Lingual papilla
 - d. Hard palate
 - e. Sulcular epithelium

- 12. What does bleeding caused by probing indicate?**
 - a. Loss of crestal bone
 - b. An increase in gingival vasculature
 - c. Fibrosis in the connective tissue
 - d. Ulceration of crevicular epithelium
 - e. Apical migration of junctional epithelium

- 13. Which of the following tissue changes result in erythematous gingiva?**
 - a. Increased keratinization
 - b. Presence of inflammatory cells
 - c. Increased vascularization
 - d. Increased production of collagen
 - e. Necrosis of epithelium

- 14. What type of connective tissue underlies the epithelium of the gingival?**
 - a. Reticular
 - b. Elastic
 - c. Fibrous
 - d. Submucosa
 - e. Oxytalan

- 15. In gingivitis, poor tissue tone is caused by:**
- Bleeding
 - Dilation of blood vessels
 - Destruction of collagen fibers
 - Large numbers of inflammatory cells
- 16. The MOST likely periodontal diagnosis for this client would be:**
- Generalized severe chronic periodontitis
 - Generalized severe chronic gingivitis
 - Generalized moderate chronic gingivitis with localized area of severe chronic periodontitis
 - Generalized moderate chronic periodontitis with localized severe chronic periodontitis
 - Generalized mild chronic periodontitis
- 17. The possible cause of the furcation involvement on the facial area of #30 is:**
- Enamel projection onto the root surface
 - Palato-gingival groove
 - Occlusal trauma
 - Frena pull
 - None of the above; no furcation involvement is noted radiographically
- 18. Definitive diagnosis of furcation involvement is made by:**
- Clinical probing
 - Reviewing the client's history
 - Checking the mobility of the tooth
 - Inspecting the radiographs of the area
- 19. Enamel projections on the root surface are attributed to the differentiation of:**
- Cementoblasts
 - Enamel spindles
 - Primary enamel cuticle
 - Enamel tufts
 - Hertwig's epithelial root sheath
- 20. Hertwig's epithelial root sheath is derived from the:**
- Inner enamel epithelium
 - Reduced enamel epithelium
 - Primary enamel cuticle
 - Rests of Malassez
 - Periodontal ligament
- 21. Hertwig's epithelial root sheath is entirely composed of:**
- All layers of the enamel organ
 - Enamel organ and dental papilla
 - Inner and outer cells of the dental papilla

- d. Inner and outer enamel epithelium
- e. Dental papilla and dental sac

22. When is root formation completed?

- a. On tooth eruption
- b. 2 to 3 months after eruption
- c. 6 to 8 months after eruption
- d. 1 to 4 years after eruption
- e. Never

23. Remnants of Hertwig's epithelial root sheath found in the periodontal ligament of a functioning tooth are called:

- a. Enamel pearls
- b. Denticles
- c. Rests of Malassez
- d. Cementicles
- e. Intermediate plexus

Use Case C to answer questions 24 to 36.

CASE C

A 12-year-old client with orthodontics has generalized healthy gingiva that is coral pink and stippled. The orthodontist has stated that the tooth movement is on schedule. Some recession is noted on the maxillary left canine and the first premolar. The first premolar demonstrates some mobility. Orthodontic tooth movement involves the function of the periodontal ligament, cementum, and alveolar bone.

24. The stippled texture of the gingiva may be attributed to:

- a. Keratinization
- b. Connective tissue projections
- c. Presence of submucosa
- d. Optimal blood supply
- e. Pigmentation

25. The color of the gingiva may be attributed to all of the following EXCEPT one. Which one is the EXCEPTION?

- a. Keratinization
- b. Connective tissue projections
- c. Thickness of the epithelium
- d. Blood supply
- e. Pigmentation

26. During orthodontic treatment, pressure applied to the periodontal ligament is intended to produce bone formation. Pressure on the periodontal ligament stimulates bone formation.

- a. Both statements are TRUE
- b. Both statements are FALSE

- c. The first statement is TRUE; the second statement is FALSE
 - d. The first statement is FALSE; the second statement is TRUE
- 27. A specialized periosteum which forms and resorbs bone and cementum is called:**
- a. Circumferential bone
 - b. Endosteum
 - c. Cortical bone
 - d. Lamina dura
 - e. Periodontal ligament
- 28. Cementum resorbs less readily than does bone. Cementoid, the outer, less calcified layer of cemental tissue, results in cementum resorbing less readily than bone.**
- a. Both statements are TRUE
 - b. Both statements are FALSE
 - c. The first statement is TRUE; the second statement is FALSE
 - d. The first statement is FALSE; the second statement is TRUE
- 29. Cementum is a product of:**
- a. Periodontal ligament
 - b. Dentin
 - c. Pulp
 - d. Hertwig's root sheath
 - e. Alveolar bone
- 30. The outer, less calcified layer of cementum is called:**
- a. Cellular cementum
 - b. Acellular cementum
 - c. Cementoid
 - d. Cementicles
 - e. Sharpey's fibers
- 31. Which of the following cells does the periodontal ligament contain?**
- a. Fibroblasts and osteocytes
 - b. Osteoclasts and cementoblasts
 - c. Cementocytes and fibroblasts
 - d. Osteocytes and cementocytes
 - e. Osteoblasts and osteocytes
- 32. The maxillary right canine and the first premolar were orthodontically moved labially outside of the outer cortical plate. A cleft-like absence of the alveolar cortical plate resulting in a denuded root surface is called:**
- a. Lability
 - b. Physiologic migration

- c. Dehiscence
 - d. Fenestration
- 33. Which of the following are characteristics of bundle bone (the alveolar bone proper)?**
- a. Covered by endosteum and adjacent to periodontal ligament
 - b. Adjacent to periodontal ligament and adjacent to fatty marrow
 - c. Adjacent to fatty marrow and containing Sharpey's fibers
 - d. Adjacent to the periodontal ligament and containing Sharpey's fibers
- 34. Which of the following tissues of the normal periodontium is the alveolar bone directly adjacent to?**
- a. Periodontal ligament and gingival epithelium
 - b. Cementum, epithelial attachment, and gingival epithelium
 - c. Periodontal ligament and gingival connective tissue
 - d. Periodontal ligament and epithelial attachment
 - e. Periodontal ligament and cementum
- 35. Alveolar bone is the most stable of all periodontal tissues. Pressures used in orthodontic therapy encourage the bone to be stable.**
- a. Both statements are TRUE
 - b. Both statements are FALSE
 - c. The first statement is TRUE; the second statement is FALSE
 - d. The first statement is FALSE; the second statement is TRUE
- 36. Through tooth movement, the periodontal ligament fibers must be reoriented. The cells that are important in the formation of the principal fibers of the periodontal ligament are:**
- a. Cementoblasts
 - b. Cementoclasts
 - c. Osteoblasts
 - d. Osteoclasts
 - e. Fibroblasts
- 37. The types of epithelia found lining the oral cavity include:**
- a. Simple and stratified squamous
 - b. Stratified, cuboidal, and squamous
 - c. Keratinized, simple, and stratified squamous
 - d. Keratinized and nonkeratinized stratified squamous
- 38. Epithelial tissues are characterized by:**
- a. Much intercellular substance and few cells
 - b. No intercellular substance
 - c. Little intercellular substance and many cells
 - d. Intercellular substance in surface layer only

- 39. Embryonically, the mandible is derived from the:**
- Stomodeum
 - First branchial arch
 - Frontal process
 - Second branchial arch
 - Third branchial arch
- 40. The anterior portion, or body, of the tongue develops from the:**
- Second branchial arch
 - Maxillary process
 - Mandibular process
 - Globular process
 - Rathke's pouch
- 41. A cleft lip occurs when the maxillary process fails to fuse with the:**
- Palatine process
 - Globular process
 - Lateral nasal process
 - Mandibular process
 - Opposing maxillary process
- 42. One of the first structures of the face to develop in the primitive embryo is the:**
- Mandible
 - Nose
 - Stomodeum
 - Maxilla
 - First branchial arch
- 43. The lateral palatine processes initially grow downward toward the future floor of the mouth. This is caused by the presence of the:**
- Tongue
 - Nasal septum
 - Maxillary process
 - Premaxilla
 - Mandibular process
- 44. When a cleft of the alveolar process is present, it occurs between the:**
- First and second premolars
 - Central incisors
 - Lateral incisor and canine
 - Canine and first premolar
 - Central and lateral incisor
- 45. The cementum is derived from the:**
- Reduced enamel epithelium
 - Dental papilla

- c. Outer enamel epithelium
 - d. Dental sac
 - e. Alveolar bone
- 46. During embryonic development, neural crest cells migrate to the branchial arches and surround the:**
- a. Ectoderm
 - b. Mesoderm
 - c. Endoderm
 - d. Ectoderm, mesoderm, *and* endoderm
- 47. All of the following tooth tissues are derived from the mesoderm EXCEPT one. Which one is the EXCEPTION?**
- a. Enamel
 - b. Dentin
 - c. Cementum
 - d. Periodontal ligament
 - e. Alveolar bone
- 48. Which of the following is NOT part of the enamel organ?**
- a. Outer enamel epithelium
 - b. Dental papilla
 - c. Stratum intermedium
 - d. Inner enamel epithelium
 - e. Stellate reticulum
- 49. The periodontal ligament is derived from the:**
- a. Dental sac
 - b. Dental papilla
 - c. Dental lamina
 - d. Cementum
 - e. Alveolar bone
- 50. Dentin is a product of the:**
- a. Dental lamina
 - b. Dental organ
 - c. Dental papilla
 - d. Dental cuticle
 - e. Dental sac

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Chapter Review - Answers and Rationales

1. **E. The nodule in the area of the labial piercing was diagnosed as a cyst. A cyst is not composed entirely of connective tissue it is an abnormal pathologic sac with the cavity lined by epithelium; it is enclosed by connective tissue and is diagnosed on the basis of histologic appearance and location.**
 - A. It is an abnormal sac, but it is also a cavity lined by epithelium; it is enclosed by connective tissue and is diagnosed on the basis of histologic appearance and location.
 - B. It is a cavity lined by epithelium, but it is also an abnormal sac, and it is enclosed by connective tissue and is diagnosed on the basis of histologic appearance and location.
 - C. It is enclosed by connective tissue, but it is also an abnormal sac, lined by epithelium and is diagnosed on the basis of histologic appearance and location.
 - D. It is diagnosed on the basis of histologic appearance and location, but it is also an abnormal sac lined by epithelium, and it is enclosed by connective tissue.

2. **A. Cells of the stratum basal layer undergo mitosis. This layer forms cells to maintain and replace cells that are lost at the surface. The cells that are produced in the basal layer move up through the other layers until they reach the surface where they are shed.**
 - B. The stratum lucidum is a clear layer that can be seen between the stratum granulosum and stratum corneum in thicker stratified squamous epithelium of the soles of the feet or palms of the hand.
 - C. The stratum corneum layer is the surface layer of stratified squamous epithelium. The cells of this layer may be dead, and they do not divide. These cells are shed. In keratinized tissue, they exhibit no nuclei; but in para-keratinized tissue, they still show signs of a nuclei.
 - D. The stratum spinosum, or prickle layer, is just superficial to the basal layer, so some cells close to the basal layer may exhibit mitosis, but the cells in this layer lose their ability to divide as they progress to the surface.
 - E. The stratum granulosum contains kerato-hyalin granules that eventually cause the cells to die. These cells are not capable of mitosis.

3. **C. The most accepted theory is that hypersensitivity of the dentinal surface to external stimuli is caused by fluid movement within the tubules that transmit signals to the nerves in the pulp chamber.**
 - A. Fluid entering the sulcular epithelium does not result in dentinal hypersensitivity.
 - B. Fluid must enter the dentinal tubules to produce dentinal hypersensitivity.
 - D. Fluid must enter the dentinal tubules to produce dentinal hypersensitivity.

4. **C. The pulp and the periodontal ligament have nerve innervation.**

- A. Dentin and enamel have no nerve innervation. Nerves associated with dentin are located in the pulp. The pulp and the periodontal ligament have nerve innervation.
 - B. Enamel and cementum have no nerve innervation
 - D. The pulp and the periodontal ligament have nerve innervation. Cementum has no nerve innervation. Nerves associated with dentin are located in the pulp.
5. **B. The bodies of the odontoblast in a fully developed crown are located in the pulp.**
- A. Odontoblasts are dentin forming cells, but in a fully developed crown, only the cytoplasmic extensions of the odontoblasts remain in the dentin. The bodies of the odontoblasts reside in the living pulp. Here they remain capable of producing additional dentin.
 - C. The bodies of the odontoblast reside in the pulp.
 - D. The bodies of the odontoblast reside in the pulp.
 - E. The bodies of the odontoblast reside in the pulp.
6. **D. "Abrasion" is defined as pathological wear of tooth by foreign substance. It is pathologic loss of tooth structure by abnormal and repetitive mechanical wear.**
- A. *Attrition* is tooth-to-tooth wear.
 - B. *Erosion* is the loss of tooth substance as a result of chemical agents.
 - C. *Abfraction* means "to break away." Loss of tooth structure at or under the cemento-enamel junction (CEJ) occurs because of biomechanical loading.
 - E. Caries occurs when plaque biofilm adheres to tooth surface, the mineral substance of the tooth is dissolved by acids, and the organic substance of tooth is destroyed by proteolysis.
7. **B. The crest of the alveolar bone is 0.75 to 1.49 mm apical to the CEJ in normal healthy periodontium.**
- A. The crest of the alveolar bone is 0.75 to 1.49 mm apical to the CEJ in normal healthy periodontium.
 - C. The crest of the alveolar bone is 0.75 to 1.49 mm apical to the CEJ in normal healthy periodontium.
 - D. The crest of the alveolar bone is 0.75 to 1.49 mm apical to the CEJ in normal healthy periodontium.
 - E. The crest of the alveolar bone is 0.75 to 1.49 mm apical to the CEJ in normal healthy periodontium.
8. **C. True, when a cyst shows up radiographically, it exhibits well-defined borders, but the labial cyst is a soft-tissue cyst. Soft-tissue cysts do not show up radiographically, so this statement is false.**
- A. Both statements are not true. Soft-tissue cysts do not show up radiographically, so this statement is false.
 - B. Both statements are not false. True, when a cyst shows up radiographically it exhibits well well-defined borders
 - D. The first statement is true not false. The second statement is false not true True, when a cyst shows up radiographically it exhibits well well-defined borders, but the labial cyst is a soft-tissue cyst. Soft-tissue cysts do not show up radiographically, so this statement is false.

9. **C. The gingival sulcus is usually lined with nonkeratinized stratified epithelium. In a healthy epithelial lining, rete pegs are absent. This client has an unhealthy gingival sulcus with noted bleeding upon probing that is usually characterized by the presence of rete pegs and sulcular ulcerations. The bleeding also signifies the presence of sulcular ulcerations.**
- A. The gingival sulcus is usually lined with nonkeratinized stratified epithelium. In health, no rete pegs are present in this epithelial lining. This client has an unhealthy gingival sulcus with noted bleeding upon probing that is usually characterized by the presence of rete pegs and sulcular ulcerations. Bleeding signifies the presence of sulcular ulcerations.
 - B. The gingival sulcus is usually lined with nonkeratinized stratified epithelium. This client has an unhealthy gingival sulcus with noted bleeding upon probing that is usually characterized by the presence of rete pegs. Bleeding signifies the presence of sulcular ulcerations.
 - D. The gingival sulcus is usually lined with nonkeratinized stratified epithelium. This client has an unhealthy gingival sulcus that is usually characterized by the presence of rete pegs. Bleeding signifies the presence of sulcular ulcerations.
 - E. The gingival sulcus is usually lined with nonkeratinized stratified epithelium. This client has an unhealthy gingival sulcus that is usually characterized by the presence of rete pegs. Bleeding signifies the presence of sulcular ulcerations. Parakeratinized tissue is different from keratinized tissue. In parakeratinized tissue the cells of the corneum layer retain their nuclei and in keratinized tissue the cells of the corneum have no visible nuclei.
10. **B. The bottom of the sulcus is the junctional epithelium, and it is between the tooth and gingival connective tissue.**
- A. The marginal gingiva is the crest or border of the gingiva.
 - C. The alveolar crest is the occlusal border of alveolar process near the cervix of the tooth. Observation of the alveolar crest is noted on radiographs to determine bone loss. The alveolar crest of bone joins two tooth sockets.
 - D. Sulcular epithelium is the nonkeratinized epithelium that lines the sulcular wall.
 - E. Periodontal ligament is a layer of connective tissue that surrounds the tooth root and occupies space between the tooth root and the bone of the tooth socket.
11. **E. Sulcular epithelium is nonkeratinized.**
Attached gingiva, interdental papilla, lingual papilla and the hard palate are keratinized
12. **D. The bleeding comes from the underlying connective tissue. Epithelial tissue is not vascular. Bleeding results when the sulcular and junctional epithelia are inflamed and intracellular spaces are increased in size or when the crevicular (sulcular) epithelium thins or becomes ulcerated. These conditions allow the probe to penetrate the epithelium and contact the underlying vascular connective tissue.**
- A. Loss of the alveolar crest exhibits itself as radiographic bone loss, not bleeding; bleeding comes from the underlying connective tissue.
 - B. Increased gingival vasculature exhibits clinically as a change in gingival color from coral pink to erythematous; bleeding comes from the underlying connective tissue.

- C. Fibrosis of the gingival tissue results from the increase of fibrous intercellular tissue in the gingival connective tissue. This results in a change of gingival texture to fibrous or nodular. It does not manifest as bleeding.
- E. Apical migration of the junctional epithelium results in an increase of attachment loss; it does not result in bleeding.
13. **C. Increased gingival vasculature exhibits clinically as a change in the gingival color from coral pink to erythema. The gingival epithelium is not vascular. The color comes from the underlying vascular connective tissue. If that vasculature increases, the color of the tissue will become more erythematous.**
- A. Increased keratinization results in the gingiva being lighter in color. Gingival epithelium is not vascular. The color comes from the underlying vascular connective tissue. If the overlying epithelium is thicker, the gingiva will appear lighter in color. Keratinization results in thicker epithelium.
- B. The presence of inflammatory cells will cause a change in the color of the inflammatory exudates; it will not result in a change in gingival color.
- D. Increase in collagen fibers results in a more fibrous texture of the gingiva; bleeding comes from the underlying connective tissue.
- E. Necrosis of the epithelium results in death of epithelial cells and the appearance of a grayish pseudomembrane. Epithelial tissue is not vascular; bleeding comes from the underlying connective tissue.
14. **C. The type of connective tissue that underlies the gingiva is fibrous connective tissue (lamina propria). The fibrous connective tissue gives the gingiva its firm consistency.**
- A, B, D, E. The type of connective tissue that underlies mucosa and skin is fibrous connective tissue (also known as lamina propria).
15. **C. The loss of collagen fibers during the inflammatory process of gingivitis results in a change of gingival consistency from firm to a poor, more flaccid consistency.**
- A. The bleeding comes from the underlying connective tissue. Epithelial tissue is not vascular. Bleeding results when the sulcular and junctional epithelia are inflamed and intracellular spaces are increased in size or when the crevicular (sulcular) epithelium thins or becomes ulcerated. These conditions allow the probe to penetrate the epithelium and come in contact with underlying vascular connective tissue.
- B. Dilation of gingival vasculature exhibits clinically as a change in the gingival color from coral pink to erythema.
- D. The presence of inflammatory cells will cause a change in the color of the inflammatory exudates.
16. **C. This client has generalized, moderate, chronic, marginal gingivitis with a localized area of severe periodontitis. The rationale is as follows: This client exhibits longstanding inflammation (chronic) of the papillary and marginal gingiva in over 30% (generalized) of the mouth. The attached gingiva does not exhibit signs of inflammation, and no attachment loss or bone loss is present in any area of the mouth except tooth #30. Tooth # 30 has inflammation and an attachment loss reading of 7 mm (severe periodontitis). The attachment loss is a sign that the destruction on that**

involves other tissues of the periodontium besides the gingiva (periodontitis). Loss of attachment occurs at the junctional epithelium. The attachment migrates apically from its normal position at or around the cemento-enamel junction (CEJ). The presence of loss of attachment is a critical factor in distinguishing between gingivitis and periodontitis.

- A. Over 30% of the mouth does not have bone loss or attachment loss. The one area of 7 mm of attachment loss would be evaluated as localized severe periodontitis. The inflammation of margins and papilla in the rest of the mouth would be evaluated as generalized moderate marginal gingivitis.
 - B. For gingivitis to be categorized as severe gingivitis, inflammation of the attached gingiva must be evident. The attached gingiva exhibits no signs of inflammation.
 - C. The inflammation of the margins and papilla in the rest of the mouth would be evaluated as generalized, moderate, marginal gingivitis. The one area of 7 mm of attachment loss would be evaluated as localized severe periodontitis.
 - D. The generalized condition of this patient is gingival inflammation. The inflammation of margins and papilla in over 30% of the mouth would be evaluated as generalized, moderate, marginal gingivitis. Periodontitis is evident only in one area and the loss of attachment reading is 7 mm. This area would be evaluated as localized severe periodontitis.
 - E. The generalized condition of this patient is gingival inflammation. The inflammation of margins and papilla in over 30% of the mouth would be evaluated as generalized, moderate, marginal gingivitis. Periodontitis is evident only in one area and the loss of attachment reading is 7 mm. This area would be evaluated as localized severe periodontitis.
17. **A. An enamel projection on the root occurs when cells from Hertwig's epithelial root sheath differentiate into ameloblasts and lay down some enamel in the area close to the CEJ. The attachment of the soft tissue to the tooth is not the fibrous attachment that occurs when cementum is present on the root. This attachment to enamel is a more fragile attachment rendering the area more susceptible to periodontal problems. The radiographs reveal a radiopacity continuous with the enamel in this area.**
- B. Although a palatogingival groove makes a tooth more susceptible to a periodontal problem, palatogingival grooves are more common on maxillary incisors, and they would not appear as a radiopacity on a radiograph.
 - C. Occlusal trauma would not appear as a radiopacity on a radiograph. No radiographic or clinical signs of occlusal trauma are evident.
 - D. No frenum pull is noted, and a frenum pull would not appear as a radiopacity on a radiograph.
 - E. Not all furcation involvements are apparent radiographically. A furcation was clinically diagnosed with a probe.
18. **A. A definitive diagnosis of a furcation involvement is made through clinical probing. Not all furcation involvements are apparent radiographically.**
- B. Furcations cannot be definitively diagnosed through client history. Clinical probing is necessary to definitively diagnose furcation involvement.

- C. Checking mobility cannot definitively diagnose furcation involvement. Clinical probing is necessary to definitively diagnose furcation involvement.
 - D. Not all furcation involvements are apparent radiographically
19. **E. An enamel projection on the root occurs when cells from Hertwig's epithelial root sheath differentiate into ameloblasts and lay down some enamel in the area close to the CEJ. Hertwig's epithelial root sheath is derived from the reduced enamel organ. Cells from the inner enamel epithelium and cells from the outer enamel epithelium migrate apically to form Hertwig's epithelial root sheath. Occasionally, some cells from the stratum intermedium layer of the enamel organ remain next to cells of the inner enamel epithelium. It is believed that these cells stimulate the differentiation of the cells of the inner enamel epithelium to differentiate into ameloblasts and form an area of enamel in the root area.**
- A. Cementoblasts do not play a role in enamel formation. Cementoblasts are cementum-forming cells that come from the periodontal ligament. After the formation of root dentin and the disintegration of Hertwig's epithelial root sheath, they begin to lay down cementum.
 - B. Enamel spindles are the peripheral ends of the cytoplasmic processes of the odontoblast. They extend across the dentino-enamel junction (DEJ) into the enamel and do not play a role in enamel formation
 - C. The primary enamel cuticle plays no role in root formation. It is the calcified covering over the enamel that was produced by the ameloblasts.
 - D. Enamel tufts do not play a role in enamel formation. Enamel tufts look like small brushes attached to the DEJ that extend outward into the enamel. They are the uncalcified inner ends of the enamel rods.
20. **B. Hertwig's epithelial root sheath is derived from the reduced enamel organ. Cells from the inner enamel epithelium and cells from the outer enamel epithelium migrate apically to form Hertwig's epithelial root sheath.**
- A. Hertwig's epithelial root sheath is derived from the reduced enamel organ. Although the inner enamel epithelium cells are part of the cervical loop that migrates apically from the reduced enamel organ to form Hertwig's epithelial root sheath, other cells (the outer enamel epithelial cells) are also present.
 - C. The primary enamel cuticle plays no role in Hertwig's root sheath formation. It is the calcified covering over the enamel that was produced by the ameloblasts.
 - D. The Rests of Malassez are remnants of Hertwig's epithelial root sheath that remain in the periodontal ligament space following root formation. They do not form Hertwig's epithelial root sheath.
 - E. Hertwig's epithelial root sheath is derived from reduced enamel epithelium. It is not derived from the periodontal ligament. Hertwig's epithelial root sheath dictates root dentin formation. The periodontal ligament plays a role in cementum formation
21. **D. Hertwig's epithelial root sheath is derived from the most cervical portion of the reduced enamel epithelium (organ). It consists of only two layers of the organ: the inner enamel epithelium and the outer enamel epithelium.**

- A. Hertwig's epithelial root sheath is derived from the most cervical portion of the reduced enamel epithelium (organ). It consists of only two layers of the organ: the inner enamel epithelium and the outer enamel epithelium. Also present in the reduced enamel organ are the stratum intermedium and stellate reticulum. These two layers are not part of Hertwig's epithelial root sheath.
- B. Hertwig's epithelial root sheath is derived from the most cervical portion of the reduced enamel epithelium (organ). It consists of only two layers of the organ: the inner enamel epithelium and the outer enamel epithelium. It does not come from the dental papilla portion of the tooth germ. Dentin and pulp develop from the dental papilla.
- C. Hertwig's epithelial root sheath is derived from the most cervical portion of the reduced enamel epithelium (organ). It consists of only two layers of the organ: the inner enamel epithelium and the outer enamel epithelium. Dentin and pulp develop from the dental papilla.
- E. Hertwig's epithelial root sheath is derived from the most cervical portion of the reduced enamel epithelium (organ). It consists of only two layers of the organ: the inner enamel epithelium and the outer enamel epithelium. Dentin and pulp develop from the dental papilla. The dental sac gives rise to the periodontal ligament.
22. **D. Root completion occurs 1 to 4 years after eruption.**
A, B, C, and E are not the correct time periods.
23. **C. The Rests of Malassez are remnants of Hertwig's epithelial root sheath that remain in the periodontal ligament space following root formation. They are the source of cyst formation.**
- A. Enamel pearls are spherical enamel formations on the root surface that are thought to result from the differentiation of Hertwig's epithelial root sheath cells into ameloblasts.
- B. Denticles are calcified bodies found within the pulp chamber.
- D. Cementicles are calcified bodies of cementum found in the periodontal ligament space.
- E. The intermediate plexus is an area of interwoven fibers in the central region of periodontal ligament. Fibers coming from the bone end are intertwined with fibers that extend from the cementum.
24. **B. Stippling is caused by the interdigitation between the epithelium and connective tissue. Connective tissue extensions into the overlying epithelium are called *connective tissue papilla*. The epithelium extensions into connective tissue are called *rete pegs*.**
- A. Keratinization of the gingiva affects the color, not the stippled texture of the gingiva.
- C. The gingiva has no submucosa.
- D. The blood supply affects color, not the stippled texture of the gingiva.
- E. Pigmentation affects color, not the stippled texture of the gingiva.
25. **B. Connective tissue papilla affect the texture of the gingiva, not the color.**
A, C, D, E. The color of the gingiva is affected by the keratinization, thickness of the epithelium, blood supply, and pigmentation.

26. **B. Pressure on the periodontal ligament stimulates resorption of bone. Tension initiates bone formation; therefore, both statements in the original question are false.**
- A. Both statements are false.
 - C. Both statements are false.
 - D. Both statements are false.
27. **E. Periosteum is a tough connective tissue membrane that covers the outside surface of bone and functions in the formation and resorption of bone. The periodontal ligament is specialized periosteum. On one side, it is capable of the formation and resorption of bone; and on the other side, it functions in the formation and resorption of cementum.**
- A. Circumferential bone is lamellar; it is the outside layer of most bone, and it is not arranged in concentric circles. It is covered by periosteum.
 - B. Endosteum is a thinner, more delicate connective tissue membrane that covers the inner surface of compact bone, trabeculae, and lines Haversian canals and Volkmann's canals.
 - C. Cortical bone is the plates of bone on the facial and lingual surfaces of the alveolar bone.
 - D. Lamina dura is the radiographic item for the alveolar bone proper or the bone of the tooth socket.
28. **A. True. Cementoid is the outer less calcified layer of cemental tissue. It is the layer of organic matrix that was most recently laid down. This cementoid layer results in cementum resorbing less readily than bone.**
29. **A. Cementum is a product of the periodontal ligament. The periodontal ligament developed from the dental sac portion of the tooth germ, and it contains cementum-forming cells.**
- B. Cementum is a product of the periodontal ligament, not dentin.
 - C. Cementum is a product of the periodontal ligament, not pulp.
 - D. Hertwig's epithelial root sheath dictates root dentin formation, but the cells that form cementum come from the periodontal ligament.
 - E. Cementum is a product of the periodontal ligament. The alveolar bone is also a product of the periodontal ligament.
30. **C. Cementoid is the outer less calcified layer of cemental tissue. It is the layer of organic matrix that was most recently laid down. This cementoid layer results in cementum resorbing less readily than bone.**
- A. Cellular cementum is that portion of cementum that contains cementocytes and is capable of forming additional cementum throughout the life of the tooth.
 - B. Acellular cementum is that portion of cementum that does not contain cementocytes and therefore is not capable of forming additional cementum throughout the life of the tooth.
 - D. Cementicles are calcified bodies of cementum found in the periodontal ligament space.
31. **B. The periodontal ligament is specialized periosteum that is capable of forming and resorbing cementum and bone. It contains osteoblasts, osteoclasts, cementoblasts, cementoclasts, and cells for the formation and resorption of fibers (fibroblasts and**

- fibroblasts). It does not contain osteocytes (osteoblasts that are entrapped in bone) or cementocytes (cementoblasts that are entrapped in cementum).**
- A. The periodontal ligament contains fibroblasts. It does not contain osteocytes. Osteocytes are osteoblasts that are entrapped in bone.
 - C. The periodontal ligament does not contain cementocytes. Cementocytes are cementoblasts that are entrapped in cementum. The periodontal ligament does contain fibroblasts.
 - D. The periodontal ligament does not contain osteocytes. Osteocytes are osteoblasts that are entrapped in bone. The periodontal ligament does not contain cementocytes. Cementocytes are cementoblasts that are entrapped in cementum.
 - E. The periodontal ligament does contain osteoblasts. It does not contain osteocytes; osteocytes are osteoblasts that are entrapped in bone.
32. **C. Dehiscence is a cleft-like absence of alveolar plate that results in denuded root surface. It occurs more often on facial than lingual and more often on anterior than posterior, and it is usually bilateral.**
- A. Lability means the alveolar bone is constantly remodeled by means of resorption and formation; pressures used in orthodontic therapy encourage the bone to change; this makes bone the least stable of the periodontal tissues.
 - B. Physiologic migration is the natural mesial drift of teeth caused by proximal wear. This involves gradual bone reconstruction.
 - D. Fenestration is a window or circumscribed defect in the cortical plate that exposes facial or lingual root surface. This client has a cleft-like defect.
33. **D. Bundle bone is adjacent to the periodontal ligament. It contains one end of Sharpey's fibers.**
- A. Endosteum is a thinner, more delicate connective tissue membrane that covers the inner surface of compact bone, trabeculae, and lines Haversian canals and Volkmann's canals. It does not cover bundle bone. Bundle bone is bone adjacent to the periodontal ligament.
 - B. Bundle bone is bone adjacent to the periodontal ligament, but the bundle bone is localized within the alveolar bone proper. It is not adjacent to the fat marrow.
 - C. Bundle bone is located within the alveolar bone proper. It is not adjacent to the fat marrow and does not contain one end of the Sharpey's fibers.
34. **C. The alveolar bone is adjacent to the periodontal ligament and the gingival connective tissue.**
- A. The gingival epithelium has no contact with alveolar bone.
 - B. Cementum and the gingival epithelium have no contact with alveolar bone.
 - D. The epithelial attachment has no contact with alveolar bone.
 - E. Cementum has no contact with alveolar bone.
35. **B. Alveolar bone is constantly remodeled by means of resorption and formation; pressures used in orthodontic therapy encourage the bone to change; this makes bone the least stable of periodontal tissues. Therefore, both statements are false.**
- A. Both statements are false.
 - C. Both statements are false.
 - D. Both statements are false.

36. **E. Fibroblasts form the principal collagen fibers of the periodontal ligament.**
A. Cementoblasts form cementum.
B. Cementoclasts resorb cementum.
C. Osteoblasts form bone.
D. Osteoclasts resorb bone.
37. **D. The type of epithelium that lines the oral cavity is keratinized and nonkeratinized stratified squamous epithelium.**
38. **C. Epithelial tissue is characterized by little intercellular substance and many cells.**
A. Connective tissue has much intracellular substance and few cells.
B. Epithelial tissue has intercellular substance.
D. Epithelial tissue has intercellular substance in layers other than the surface layer.
39. **B. The first branchial arch gives rise to a large portion of the face and the intraoral structures. The mandible is derived from the first branchial arch.**
A. The stomodeum is the primitive mouth.
C. The lower border of the frontal process gives rise to the nasal processes.
D. The second and third branchial arches play a role in tongue development.
40. **C. The mandibular process gives rise to the body of the tongue. Maxillary processes arise from the superolateral border of the first branchial arch. Once this occurs, the rest of the first branchial arch is referred to as the *mandibular process*. From the mandibular process (first branchial arch), two lateral swellings and one medial swelling (*tuberculum impar*) merge to form the body of the tongue.**
A. The second branchial arch does not give rise to the anterior portion of the tongue. It is associated with the formation of the posterior or base of the tongue.
B. The maxillary process is not associated with tongue development.
D. The globular process does not give rise to the anterior portion of the tongue.
E. Rathke's pouch is not associated with tongue development.
41. **B. Cleft lip occurs when the maxillary process fails to fuse with the globular process. The maxillary process forms the sides of the lip, and the globular process forms the center or philtrum of the lip. A cleft lip can occur on one side (e.g., the right maxillary process fails to fuse with the globular process) or on both sides (e.g., the right and left maxillary processes fail to fuse with the globular process).**
A. The palatine process fusion is not associated with cleft lip.
C. The lateral nasal process fusion is not associated with cleft lip.
D. The mandibular process fusion is not associated with cleft lip.
E. The opposing maxillary processes fuse with the globular process to form the lip. They do not fuse with each other.

42. **C. The stomodeum is the primitive mouth. It is the first structure to form during face development.**
- B. The nose develops from the lower aspect of the frontal process.
 - D. The maxilla and the mandible both develop from the first brachial arch.
 - E. First branchial arch develops at the beginning of the fourth week in embryo.
43. **A. By the end of the second month in embryo, the swellings of the tongue unite. The tongue extends upward and forward and is in the way of the lateral palatine processes fusing medially. As a result these palatal shelves initially grow downward. By the end of third month in embryo, the tongue drops and the palatal shelves fuse.**
- B. The nasal septum does not prevent the lateral palatine processes from fusing medially.
 - C. Maxillary processes give rise to the lateral palatine processes.
 - D. The premaxilla fuses with the lateral palatine processes to form the palate. The premaxillae form the anterior portion of the palate.
44. **C. A cleft of the alveolar ridge results from the lack of fusion of the premaxilla, which forms the anterior portion of the palate and gives rise to the maxillary incisors, and of the lateral palatine processes (palatal shelves), which give rise to the posterior two thirds of the hard palate and contain the maxillary canines and posterior teeth. The lines of fusion, therefore, fall between the laterals and canine teeth.**
- A. The first and second premolars are components of the same lateral palatine process; therefore, no lines of fusion are present between them.
 - B. The central incisors arise from the same premaxillary process; therefore, no lines of fusion are present between them.
 - D. The canine and the first premolar are both components of the same lateral palatine process; therefore, no lines of fusion are present between them.
 - E. The central and lateral incisors arise from the same premaxillary process; therefore, no lines of fusion are present between them.
45. **D. Cementum is derived from the periodontal ligament. The periodontal ligament arises from the dental sac.**
- A. As enamel forms, the ameloblasts move outward, and the enamel organ becomes crushed. It is then referred to as *reduced enamel epithelium (organ, REE)*. Cementum does not come from the REE.
 - B. The dental papilla forms dentin and pulp.
 - C. The outer enamel epithelium is part of the enamel organ. It does not form cementum.
 - E. Alveolar bone is formed from the periodontal ligament. The periodontal ligament arises from the dental sac. Alveolar bone does not form cementum.
46. **B. The neural crest cells migrate to surround the mesoderm tissue in the branchial arches. They play a key role in the induction of tooth tissue formation.**
- A. The ectoderm is not surrounded by neural crest cells.
 - C. The endoderm is not surrounded by crest cells.
 - D. Only the mesoderm is surrounded by neural crest cells.
47. **A. Enamel is the only tooth tissue derived from the ectoderm.**

B, C, D and E. Dentin, cementum, periodontal ligament, and alveolar bone are all derived from the mesoderm.

48. **B. The dental papilla is not part of the enamel organ. It is the part of the tooth germ that forms dentin and pulp.**
A, C, D, and E. The enamel organ is composed of inner and outer epithelia, the stratum intermedium, and the stellate reticulum.
49. **A. The periodontal ligament is derived from the dental sac.**
B. The dental papilla is the portion of the tooth germ that forms dentin and pulp.
C. The dental lamina is the thickening of oral epithelium that grows down into underlying connective tissue to initiate tooth development.
D. Cementum does not produce the periodontal ligament. It is the periodontal ligament that produces cementum.
E. Alveolar bone does not produce the periodontal ligament. It is the periodontal ligament that produces alveolar bone.
50. **C. Dentin is the product of the dental papilla.**
A. The dental lamina is the thickening of the oral epithelium that grows down into underlying connective tissue to initiate tooth development.
B. No dental organ is present in the tooth germ. The tooth germ consists of the enamel organ, the dental papilla, and the dental sac.
D. The dental cuticle is the covering over a newly formed crown.
E. The dental sac produces the periodontal ligament. The periodontal ligament will then produce cementum and alveolar bone.