

Virginia Western Community College

DNH 115

Histology/Head and Neck Anatomy

Prerequisites

Admission into the Dental Hygiene Program.

Course Description

Presents a study of the microscopic and macroscopic anatomy and physiology of the head, neck and oral tissues. Includes embryologic development and histologic components of the head, neck, teeth, and periodontium.

Semester Credits: 3

Lecture Hours: 3

Lab/Clinical/Internship Hours: 0

Required Materials

Textbook:

Illustrated Dental Embryology, Histology, and Anatomy. Bath-Balogh, Mary and Fehrenbach, Margaret J. 5th Edition. ISBN: 978-0-323-61107-7

Illustrated Anatomy of the Head and Neck. Margaret J. Fehrenbach, Susan W. Herring. 6th Edition. ISBN: 978-0-323-61301-9

Clinical Practice of the Dental Hygienist. Boyd, Linda D, Mallonee, Lisa F. Wyche, Charlotte J. 13th Edition. ISBN: 978-1496396273

Course Outcomes

At the completion of this course, the student should be able to:

- Relate the histological components/structures of tissues of the oral cavity to gross anatomical structures
- Develop insight into the structures of the head and neck relating to surface anatomy and to the underlying supporting tissues
- Relate embryologic development of the head and neck to normal and abnormal intra and extra-oral clinical findings.
- Develop a detailed knowledge of the individual micro and macroscopic characteristics and functions of intra-and extra-oral structures of the head and neck
- Develop a working knowledge of anatomical terminology for both identification and functional purposes. Expect questions in pre-clinic lab
- Begin to apply knowledge of oral-facial histology and anatomy to pre-clinic level client services
- Apply and integrate knowledge acquired in this course with other dental hygiene science and clinical courses taught in the curriculum

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- Develop insight into the structures of the head and neck relating to surface anatomy and to the underlying supporting tissues
- Develop a detailed knowledge of the individual macroscopic characteristics and functions of intra and extra-oral structures of the head and neck
- Begin to apply knowledge of oral-facial anatomy to pre-clinic level patient services
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Topical Description

Unit 1 (Histology): Course Introduction, Embryology

- Prenatal Development Periods
- Development from Zygote to Germ Disc
- Understanding the Physiologic Processes
- Embryonic Germ Layers and Body Tissues
- The Significance of the Primitive Streak, Neural Crest and Mesodermal Somites
- Ectomesenchyme and Neural Crest Cells
- Timeframe and Developmental Sequence of the Face, Palate & Tongue
- Structures Derived from the Frontonasal Process
- Branchial Arches and their Derivative Structures
- Developmental Disturbances

Unit 1 (Head/Neck): Surface Anatomy, Skeletal System, Cervical Vertebrae

- Anatomical Nomenclature
- Surface Anatomy
- Regions of the Head
- Regions of the Neck
- Overview of the Skeletal System
- Bones of the Head and Neck
- Abnormalities of Bone

Unit 2 (Histology): Cells and Tissues

- The Cell
- Cell Division
- Extracellular Materials
- Intercellular Junctions
- Basic Tissue
- Epithelium
- Basement Membrane
- Connective Tissue
- Specialized Connective Tissue
- Muscle
- Nerve Tissue

Unit 2 (Head/Neck): Temporomandibular Joint, Mandible, Muscular System

- Overview of the Muscular System
- Muscles of the Head and Neck
- Overview of the Temporomandibular Joint
- Jaw Movements with Muscle Relationships
- Disorders of the Jaw

Unit 3 (Histology): Oral Mucosa, Salivary Glands and Tonsils

- Oral Mucosa
- Regional Differences in Oral Mucosa
- Pigmentation of Oral Mucosa
- Aging and the Skin
- Turnover Time, Repair, and Aging of the Oral Mucosa
- Histology of Salivary Glands
- Secretory Cells and Acini
- Ductal System
- Major Salivary Glands
- Minor Salivary Glands
- Development of Salivary Glands

Unit 3 (Head/Neck): Vascular System, Glandular Tissue

- Overview of the Vascular System
- Arterial Blood Supply to the Head and Neck
- Vascular Lesions
- Overview of the Glandular Tissue
- Lacrimal Glands
- Thyroid Gland
- Parathyroid Glands
- Thymus Glands

Unit 4 (Histology): Gingiva and Periodontium

- Periontoium
- Components of the Periodontium
- Gingival Tissue
- Dentogingival Junctional Tissue
- Enamel
- Cementum
- Periodontal Ligament
- Alveolar Bone

Unit 4 (Head/Neck): Nervous System

- Overview of the Nervous System
- Nerves to the Oral Cavity and Associated Structures
- Nerve Lesions of the Head and Neck

Unit 5 (Histology): Tooth Development

- Tooth Development
- Root Development
- Periodontal Ligament Development
- Alveolar Bone Development
- Apposition of Enamel Matrix
- Maturation of Enamel Matrix
- Microscopic Features of Mature Enamel
- Dentin-Pulp Complex
- Future Concerns with Dentin-Pulp Complex

Unit 5 (Head/Neck): Local Anesthesia, Lymph System, Fascia and Spaces, Spread of Dental Infection

- Overview of Anatomical Considerations for Local Anesthesia
- Maxillary Nerve Anesthesia
- Mandibular Nerve Anesthesia
- Overview of the Lymphatic System
- Lymph Nodes of the Head and Neck
- Lymphadenopathy
- Overview of the Fascia
- Fascial Spaces
- Infectious Process
- Dental Infections
- Infection Resistance Factors
- Spread of Dental Infections
- Prevention of the Spread of Dental Infections

Unit Objectives:

Unit 1 (Histology): Embryology

- Accurately define and use terminology that appears in italics (slide presentation) or in bold (text).
- Describe the time span for each prenatal developmental period, and discuss events that occur in each period.
- Trace development from zygote to germ disc to embryo, identifying layers and structures derived from each layer.
- Identify the physiologic processes that take place to transform the blastula to an embryo, and the embryo to a mature human.
- Identify the three embryonic layers and the body tissues and structures derived from each layer.
- Discuss the significance of the primitive streak, the neural plate/crest, and the neural tube.
- Describe the development of neural crest cells and Ectomesenchyme/mesenchymal tissue, and identify structures of the head & neck derived from mesenchyme.
- Discuss the significance of mesodermal somites.
- Describe the location and significance of the stomodeum and buccopharyngeal membrane.
- Describe the timeframe and developmental sequence of the face, palate, and tongue.
- Identify the structures derived from the frontal/frontonasal processes and Branchial/Pharyngeal arches.

- Relate developmental disturbances that may occur in the head and neck region to the appropriate prenatal development period.
- Identify causes of developmental disturbances and the various facial and oral anomalies that may result.
- Relate knowledge of the histology of basic tissues to embryonic development (unit II).
- Apply knowledge of embryology to future units of instruction and clinical practice.

Unit 1 (Head/Neck): Surface Anatomy, Bones of the Skull

- Understand why a thorough knowledge of head and neck anatomy is important for a dental hygienist.
- Define anatomical position and explain the terms used to refer to areas in relationship to other areas.
- Define plane and describe the median, sagittal, frontal and horizontal planes.
- Define superficial, deep, internal and external.
- Understand the difference between a plane and a section.
- Explain what is meant by normal anatomical variations.
- Define the regions of the head and the areas associated with each region.
- Describe the cervical triangles associated with the regions of the neck and the bones and muscles associated with each.
- Understand the definitions of key terms of the skeletal system.
- Define the bony prominences, depressions, openings and skeletal articulations.
- Explain the growth process in all bones of the skull.
- Understand how surface anatomy relates to the deeper anatomy of the head and neck.
- Locate and identify the bones of the head and neck and their landmarks on a diagram, skull, and patient.
- Describe in detail the various portions and landmarks of the maxilla and mandible.
- Discuss certain abnormalities of bone.
- Correctly complete the review questions and activities for this chapter.
- Integrate the knowledge about the skeletal system into the overall study of the head and neck anatomy and clinical dental practice.
- Be able to name the portions of the cervical vertebrae and which vertebra articulates with the skull.
- Discuss clinical implications of the maxillary sinus being in direct contact with the mucosa of the maxillary sinus.

Unit 2 (Histology): Cell, Basic Tissues, Bone and Cartilage Development

- Define histology.
- State the rationale for studying general and oral histology.
- Review the functions and characteristics of cells.
- Identify cellular components and state the functions of those components:
 - plasma membrane
 - nucleus and nucleolus
 - cytoplasm
 - organelles:
 - mitochondria
 - endoplasmic reticulum
 - golgi complex

lysosomes
filaments and tubules

- Differentiate between pinocytosis and phagocytosis.
- Differentiate between types of cell junctions.
- Relate knowledge from embryology to the derivation of the four types of tissues.
- Describe the common components of all tissues: cells, extracellular matrix/intercellular substance, tissue fluid.
- Identify the four classifications of tissues and give an example of each.
- Describe the characteristics and functions of epithelial tissues.
- Identify epithelial tissues by number of cell layers and by cell shape.
- Differentiate between epithelial lining tissues and glandular tissues.
- Recognize the significance of epithelial tissue to the structures of the oral cavity.
- Identify oral structures derived from epithelial tissue.
- Describe the relationship between connective tissue and epithelial tissue in the oral cavity.
- Name the layers of the basement membrane and the type of tissue derivation of each.
- Classify the types of connective tissue and describe the functions of the various types.
- Discuss the significance of connective tissue ground substance.
- Identify the connective tissue fiber types and the characteristics of each.
- Recognize the significance of connective tissue fibers to the oral cavity.
- Differentiate between fixed and transient connective tissue cells.
- Identify the function of each of the cell types found in connective tissues.
- Relate the functions of connective tissue cells to health and disease in the oral cavity.
- Recall the function of nervous tissue.
- Recall the classifications and divisions of the nervous system and the function of each.
- Differentiate between afferent and efferent nerves.
- Recognize the significance of the twelve cranial nerves to the oral cavity and the practice of dental hygiene.
- Describe the nerve conduction process in the central and peripheral nervous systems.
- Identify the three types of muscle tissue.
- Recall the process of muscle contraction.
- Recognize the significance of the muscles of facial expression and the muscles of mastication to the oral cavity and the practice of dental hygiene.

Unit 2 (Head/Neck): Muscular System

- State the opening on the external surface of the lower jaw that is typically between the apices of the first and second mandibular premolars and know what it carries.
- Label the heavy horizontal portion of the lower jaw inferior to the mental foramen.
- Know which portion of the lower jaw contains the roots of the teeth.
- State the name of the concave forward curve on the anterior border of the lower jaw that serves as a landmark for a dental block.
- State the bony demarcation where the ramus joins the body of the mandible.
- Know and label the small midline projections on the internal surface of the mandible as well as their function.
- Know the rounded, roughened area on each lateral edge of the mandible that is just posterior to the most distal molar.
- Know the landmark located on the medial surface of the body of the mandible and its function.

- Know the triangular depression on the anterior surface of the condyle.
- Be able to name the portions of the cervical vertebrae and which vertebra articulates with the skull.
- Discuss clinical implications of the maxillary sinus being in direct contact with the mucosa of the maxillary sinus.
- Understand the function of the TMJ.
- State the innervation and blood supply for the TMJ.
- Know which bones are articulated with the TMJ.
- Have a practical understanding of the following aspects of the TMJ:
 - the smooth, rounded ridge positioned anterior to the articular fossa;
 - the depression in the temporal bone;
 - the sharper ridge posterior to the articular fossa;
 - the specific part of the mandible that articulates with the temporal bone;
 - the process that is found posterior to the condyle;
 - the depression between the condyle and the coronoid process.
- Explain the fibrous structure that completely encloses the TMJ.
- Describe the shape of the disc.
- Explain the name and function of the secretion from the membranes lining the inside of the joint capsule.
- Know the general term given to a band of fibrous tissue connecting bones.
- Know the location and the function of the temporomandibular ligament.
- Describe the location of the sphenomandibular ligament in relation to the TMJ as well as its actions.
- Describe the sphenomandibular ligament in relation to the inferior alveolar nerve.
- Describe the location and action of the stylomandibular ligament.
- Understand the basic types of movement of the TMJ.
- Describe the palpation of the TMJ.
- Understand the possible symptoms and signs related to TMD.
- Describe treatment options for TMD. Also, discuss their effectiveness.
- Know the term for the dislocation of the TMJ and how it is treated.
- Know which part of the muscle is attached to the least movable structure and which part is attached to the most movable structure as well as what happens to muscle fibers during movement.
- Describe these muscles, know how they function during an extra-oral exam, how they are palpated, their origin/insertion/action and their innervation:
 - Sternocleidomastoid and trapezius.
- Know the muscles of facial expression and if they are single or paired.
- Determine what type of tissue all the muscles of facial expression originate and into what type of tissue they insert.
- Know the innervation for all of the muscles of facial expression.
- Determine how temporary facial paralysis can occur due to dentally caused damage.
- Epicranial muscle
 - Describe this muscle: its bellies and tendon.
 - What are its origins?
 - What are the insertions?
 - What is the action?
- Orbicularis oculi muscle

Describe its location.
What is the origin?
What is the insertion?
What is the action?

- Corrugator supercilii muscle
Describe its location.
What is the origin?
What is the insertion?
What is the action?
- Orbicularis oris muscle
Describe its location.
What is the insertion?
What is the action?
- Buccinator muscle
Describe its location.
What are the origins?
What is the insertion?
What is the action?
- Risorius muscle
What is the origin?
What is the insertion?
What is the action?
- Levator labii superioris muscle
What is the origin?
What is the insertion?
What is the action?
- Levator labii superioris alaeque nasi muscle
What is the origin?
What is the insertion?
What is the action?
- Zygomaticus major muscle
What is the origin?
What is the insertion?
What is the action?
- Zygomaticus minor muscle
What is the origin?
What is the insertion?
What is the action?
- Levator anguli oris muscle
What is the origin?
What is the insertion?
What is the action?
- Depressor anguli oris muscle
What is the origin?
What is the insertion?
What is the action?
- Depressor labii inferioris muscle

What is the origin?
What is the insertion?
What is the action?

- Mentalis muscle
 - Describe its location.
 - What is the origin?
 - What is the insertion?
 - What is the action?
- Platysma muscle
 - What is the origin?
 - What is the insertion?
 - What is the action?
- Name the muscles of mastication.
- Know the innervation of the muscles of mastication.
- Masseter muscle
 - Describe this muscle.
 - Describe its location.
 - Describe how it is palpated.
 - Describe how it can change in a patient.
 - What are the origins?
 - What are the insertions?
 - What is the action?
- Temporalis muscle
 - Describe its location.
 - What is the origin?
 - What is the insertion?
 - What is the action?
- Medial pterygoid muscle
 - Describe its location.
 - What is the origin?
 - What is the insertion?
 - What is the action?
- Lateral pterygoid muscle
 - Describe its location.
 - What is the origin?
 - What are the insertions?
 - What is the action?
- State the general function of the hyoid muscles.
- Name the suprahyoid muscles.
- Name the infrahyoid muscles.
- How can the suprahyoid muscles be further divided?
- What are the general actions of the suprahyoid muscles?
- Digastric muscle
 - Describe this muscle.
 - Describe its location.
 - What are the origins?
 - What are the insertions?

What is the innervation?

- Mylohyoid muscle
 - Describe its location.
 - What is the origin?
 - What is the insertion?
 - What is its additional action?
 - What is the innervation?
- Stylohyoid muscle
 - What is the origin?
 - What is the insertion?
 - What is the innervation?
- Geniohyoid muscle
 - What is the origin?
 - What is the insertion?
 - What is the innervation?
- What is the general action of the infrahyoid muscles?
- What is the innervation for all the infrahyoid muscles?
- Sternothyroid muscle
 - What is the origin?
 - What is the insertion?
 - What is the action?
- Sternohyoid muscle
 - What is the origin?
 - What is the insertion?
 - What is the action?
- Omohyoid muscle
 - What is the origin?
 - What is the insertion?
 - What is the action?
- Thyrohyoid muscle
 - What is the origin?
 - What is the insertion?
 - What is the action?
- How are the muscles of the tongue grouped? What are the locations of these groups?
- How is the tongue divided into two symmetrical halves?
- What is the clinical expression of this division of the tongue into halves?
- Depending on their group, what is the general action of the muscles of the tongue?
- Describe, in general, the intrinsic muscles of the tongue. Name each one and its relationship to the others.
- What is the innervation for all the intrinsic muscles of the tongue?
- Name the extrinsic muscles of the tongue.
- What is the innervation for all the extrinsic muscles of the tongue?
- Genioglossus muscle
 - What is the origin?
 - What is the insertion?
 - What is the action?
- Styloglossus muscle

What is the origin?

What is the insertion?

What is the action?

- Hyoglossus muscle
 - What is the origin?
 - What is the insertion?
 - What is the action?
- Describe the pharynx and its function. Also, describe its portions.
- What is the general function of pharynx muscle?
- Name the muscles of the pharynx.
- Stylopharyngeus muscle
 - What is the origin?
 - What is the insertion?
 - What is the action?
 - What is the innervation?
- Describe the pharyngeal constrictor muscles.
- What is the action of the pharyngeal constrictor muscles?
- What is the innervation of the pharyngeal constrictor muscles?
- Describe the soft palate and its location.
- What is the general function of the soft palate muscles?
- Name the muscles of the soft palate.
- What is the general action of the soft palate muscles?
- Know the innervation for most of the muscles of the soft palate, and what is the innervation to the one soft palate muscle that differs from the others.

Unit 3 (Histology): Oral Mucosa and Salivary Glands

- Identify the most common form of epithelial tissue found in the oral cavity.
- Differentiate between lining mucosa, masticatory mucosa, and specialized mucosa.
- Identify the non-keratinized, ortho-keratinized, and parakeratinized epithelial tissues found in the oral cavity.
- Relate the function of non-keratinized, ortho-keratinized, and parakeratinized tissues to location in the oral cavity.
- Recognize, draw and label the cell layers present in non-keratinized and ortho- and para-keratinized oral epithelium.
- Identify the role of each of the cell layers in ortho- and para-keratinized and non-keratinized epithelium.
- Identify the functions and layers of the lamina propria.
- Identify the function of the submucosa.
- Apply knowledge of the basement membrane and the relationship of the basement membrane to the epithelium and connective tissues of the oral cavity.
- Describe rete ridges/pegs and connective tissue papilla and discuss the relevance of these structures to the oral mucosa.
- Recognize pigmentation of the oral mucosa as normal, and describe the histologic basis for pigmentation.
- Compare tissue renewal rates for the various areas of the oral cavity.
- Identify the steps in the tissue repair process.
- Describe the role of epithelial and connective tissue cells in the repair process.

- Describe the significance of granulation tissue.
- Describe age-related histologic changes in oral mucosa.
- Utilize preclinic lab sessions to identify various regions of oral mucosa and compare structure and function.
- Locate and name the major salivary glands and the duct openings for each.
- Differentiate between holocrine and merocrine glands.
- Differentiate between exocrine and endocrine glands.
- Locate and name the minor salivary glands and the duct openings for each.
- Identify the types of secretions produced by the major and minor salivary glands.
- Differentiate between serous and mucous acini in terms of cell shape, shape and location of the nucleus, and secretory products.
- Identify the organic and inorganic components of salivary gland secretions.
- Relate the functions of saliva to:
 - role in plaque accumulation
 - mineralization, demineralization, and remineralization of teeth
 - supragingival calculus formation
 - digestion
- Describe the salivary glands histologically by tissue type, cell type, cell arrangement, ducts and duct systems, and relationship to surrounding connective tissue.
- Identify the function and location of myeloepithelial cells.
- Identify the function and location of intercalated, striated, and excretory ducts.
- Describe the function and location of the connective tissue, which surrounds and supports the salivary glands.
- Identify the embryonic origin and developmental timeframe for the major salivary glands.
- Identify causes of xerostomia.
- Recognize the impact of xerostomia on the hard and soft tissues of the oral cavity.
- Discuss the role of saliva substitutes.

Unit 3 (Head/Neck): Vascular System

- Understand terms for a large network of blood vessels; connecting channels between blood vessels. Type of vessels arising from the heart and carries blood away from it as well as its branching system. The type of vessel that carries blood to the heart and its branching system; and the portion of the vascular system that is a blood-filled space between two layers of tissue.
- Know the major artery arising from the common carotid and subclavian arteries on the left side of the body, as well as the direct branch from the aorta (on the right side of the body), and how it branches into the common carotid and subclavian.
- Describe which artery arises directly from the aorta (on the left side of the body) and travels up the neck, lateral to the trachea and larynx.
- Describe which artery arises directly from the aorta (on the left side of the body) and has the upper arm as its main destination.
- Know the two major arteries that supply the head and neck.
- Understand the most reliable pulse during emergency treatment and why it is so reliable.
- Know which artery supplies intracranial structures and the source of the ophthalmic artery, as well as what the ophthalmic artery supplies.
- Define which artery supplies extracranial tissues of the head and neck including the oral cavity.
- Know the major branches of the external carotid artery and how can they be grouped.

- Know which artery directly supplies tissues to the hyoid bone, infrahyoid muscles, sternocleidomastoid muscle, muscles of larynx, and thyroid gland.
- Understand which artery directly supplies tissues superior to the hyoid bone including the suprahyoid muscles, floor of mouth, and tongue.
- Understand which artery directly supplies mylohyoid muscle, the sublingual salivary gland, mucous membranes of the floor of mouth, and suprahyoid muscles.
- Outline the pathway of the facial artery and list its major branches.
- Know which artery directly supplies the soft palate, palatine muscles, and palatine tonsils.
- Know which specific artery can be a source of serious hemorrhage if it is injured during a tonsillectomy.
- Understand which artery directly supplies the submandibular lymph nodes, submandibular salivary gland, and mylohyoid and digastric muscles.
- Know which artery supplies the lower lip tissues and facial expression muscles.
- Know which artery supplies the upper lip tissues and facial expression muscles.
- Understand which artery supplies tissues along the side of the nose (and is the termination of the facial artery).
- Know which artery arises within the parotid salivary gland and can be visible in patients under the skin of their face (on the lateral portion of their forehead area).
- Know which artery directly supplies the parotid salivary gland and the nearby tissues.
- Know which artery directly supplies the temporalis muscle.
- Know which artery directly supplies portions of the scalp in the frontal and parietal regions.
- Outline the pathway of the maxillary artery and list the major branches within the infratemporal fossa.
- Know which artery directly supplies the floor of the mouth and mylohyoid muscle.
- Know which artery directly supplies tissues of the chin and with what does it anastomose.
- Know which artery directly supplies pulp tissue, gingiva, and periodontium of mandibular anterior teeth.
- Describe which artery directly supplies the anterior and posterior portions of the temporalis muscle.
- Understand which artery directly supplies the masseter muscle.
- Know which artery directly supplies the lateral and medial pterygoid muscles.
- Know which artery directly supplies the buccinator muscle and soft tissues of the cheek.
- Understand which artery directly supplies pulp tissue, periodontium, and gingiva of posterior maxillary teeth and the maxillary sinus.
- Understand which artery directly supplies the orbital region, face, and anterior maxillary teeth.
- Know which artery directly supplies the pulp tissue, periodontium, and gingiva of anterior maxillary teeth.
- Know which arteries directly supply both the hard and soft palates.
- Know which artery directly supplies the nasal cavity.
- Compare veins with arteries.
- Know which vein begins at the medial corner of the eye and drains into the internal jugular vein.
- Know which vein directly drains the tissues of the orbit.
- Know which vein directly drains the upper lip and which vein directly drains the lower lip.
- Describe which vein directly drains the tissues of the chin and submandibular region.
- Describe which vein directly drains the dorsal and ventral side of the tongue and floor of the mouth.

- Understand how the retromandibular vein created and what it will form.
- Know the location of the pterygoid plexus of veins.
- Understand with what veins the pterygoid plexus of veins anastomoses.
- In general, know which veins the pterygoid plexus of veins drain.
- Understand the function of the pterygoid plexus of veins.
- Know where the pterygoid plexus of veins drain.
- Know which veins drain blood from the deep portions of the face.

Unit 4 (Histology): Gingiva and Periodontium

- Identify the structures of the periodontium in writing and on diagrams.
- Identify the embryonic origin of the tissues of the periodontium.
- Discuss the interrelationships of the structures of the periodontium.
- Apply knowledge of head and neck anatomy to recognizing the clinical landmarks of the gingiva.
- Describe the clinical features of the gingiva in health.
- Apply knowledge of the clinical features of gingival health to examining a partner's gingiva in preclinical laboratory sessions.
- Relate histologic structure to clinical characteristics of the gingiva.
- Identify the three aspects of gingival epithelium.
- Relate the significance of keratinized and non-keratinized tissue to oral and sulcular epithelium.
- Describe the purposes of gingival sulcus fluid.
- Describe the characteristics of the junctional epithelium.
- Identify the locations of the internal and external basal lamina on a diagram. State the function of each.
- Recognize the significance of cellular turnover to the health of the gingiva.
- Draw and label the connective tissues fibers of the gingiva and state the purpose of each fiber group.
- Relate the significance of the fibroblast to the formation and integrity of the connective tissue fibers of the gingiva.
- Identify the cellular elements present in gingival connective tissue and describe the function of each.
- Discuss the significance of the reduced enamel epithelium.
- Describe the major function of cementum.
- Describe Sharpey's fibers in terms of location, insertion, and function.
- Draw and label the principle fiber groups of the periodontal ligament.
- Identify the cells found in the pdl and describe the role of each.
- Describe the role of the pdl.
- Identify the landmarks of alveolar bone on a diagram, model, and radiographs.
- Describe the radiographic appearance of the avb in health.
- Identify the role of the dental sac.
- Appreciate the role of the dental hygienist in recognizing periodontal health and identifying disease states as manifested by clinical and histological changes in the gingival tissues.

Unit 4 (Head/Neck): Nervous System

- Understand the main divisions of the nervous system and what is included within each division.
- Explain the cellular components of the nervous system, the bundles of neural processes outside of the nervous system as well as an accumulation of neuron cell bodies outside of the CNS.

- Understand the difference between efferent and afferent nerves.
- Discuss resting and action potential in regards to the physiological situation at the cell membrane and how chemical agents enter into innervation.
- Understand how anesthesia works.
- Describe the components of the brain and their functions.
- Describe the spinal cord and its function.
- Understand the main divisions of the peripheral nervous system.
- Describe the somatic nervous system and its role in the peripheral nervous system.
- Know what type of nerves are the autonomic nerves and list examples of how they relate to salivary gland secretion.
- Know the principle parasympathetic outflows of the head and neck and how this relates to the cranial nerves.
- Name the 12 cranial nerves by their anatomical terms, know if they are afferent, efferent or both as well as what they innervate.
- Understand which cranial nerve is most important to the dental professional.
- Know why the dental professional understand both the basic components of the nervous system and the location of major nerves in the head and neck.
- In what root is the trigeminal ganglion located and what other terms are used for the trigeminal ganglion.
- Know the three divisions of the sensory root.
- Know which root of the trigeminal ganglion supplies the efferent nerves for muscles of mastication.
- Know which nerve serves the mandibular teeth and the facial tissues of the mandibular anterior teeth and premolars.
- Know which nerve serves the chin, the lower lip, and the labial mucosa near the mandibular anterior teeth.
- Know which nerve supplies the submandibular and sublingual salivary glands and taste sensation for the body of the tongue.
- Understand the symptoms and signs of facial paralysis.
- Discuss injury to the facial nerve be injured, especially during dental treatment, and what are the results.
- Know the symptoms and signs of Bell's palsy; which nerve is affected and how it is treated.
- Know the signs, symptoms and treatment of trigeminal neuralgia.

Unit 5 (Histology): Tooth Development and Eruption

- Recall the embryonic derivation of the structures of the teeth.
- Relate your understanding of mesenchyme to the development of the teeth and supporting structures.
- Discuss the process of induction and relate this to tooth development.
- Identify the embryonic timeframe for tooth development.
- Differentiate between the vestibular lamina and the primary dental lamina.
- Identify the structures formed by the vestibular and the primary dental lamina.
- Identify the three-odontogenic stages.
- Describe the stages of crown development in sequence (bud, cap, bell, amelogenesis and dentinogenesis).
- Describe the stages of root development (dentinogenesis and cementogenesis).

- Identify the teeth that are derived from the dental lamina, the successional lamina, the parent lamina, and the rudimentary lamina.
- Use knowledge of the eruption sequence to gain understanding of the histologic development and sequential replacement of the primary teeth.
- Apply knowledge of tooth development and sequential replacement of primary teeth to the DNH 141 mixed dentition-charting exercise.
- Use diagrams and pictures to identify and differentiate between the bud, cap, and bell stage.
- Describe the formation of three components of the tooth germ.
- Identify the structures derived from the enamel organ, the dental papilla and the dental sac/follicle.
- Discuss the structure, location, and function of the four layers of the enamel organ.
- Draw and label a diagram of the tooth germ in the bell stage.
- Discuss the significance of the cervical loop.
- Describe the relationship between ameloblasts and odontoblasts during amelogenesis and odontogenesis.
- State the function of the basement membrane in relationship to amelogenesis and odontogenesis.
- Compare ameloblasts and odontoblasts as to cell type/derivation, matrix and ground substance, deposition of secretions, and cell life.
- Differentiate between dentinoid and mature dentin.
- Differentiate between Korff's fibers, mantle dentin, and circumpulpal dentin.
- Differentiate between tubular and peritubular dentin.
- Draw and label a diagram of the dentin and pulp.
- Discuss the role of the pulp and odontoblastic processes in dentin hypersensitivity.
- Differentiate between aprismatic and prismatic enamel.
- Describe the role of Tome's process
- Describe the location and role in amelogenesis of the terminal bar.
- Describe the location and role in amelogenesis of Tome's process.
- Discuss the role of incremental lines and Stria of Retzius in the diffusion of ions and uptake of acids and fluoride.
- Differentiate between the primary enamel cuticle and the reduced enamel epithelium.
- Describe the development of the junctional epithelium and the sulcus following enamel formation and during eruption.
- Use diagrams and pictures to gain an understanding of the development of cementum, alveolar bone, and periodontal ligament.
- Describe the process of cementogenesis and relate the time frame to crown formation.
- Discuss the role and significance of Hertwig's sheath.
- Describe the relationship between dentinogenesis and cementogenesis during root development.
- Describe the process of multiple root development and formation of furcas.
- Differentiate between cellular and acellular cementum.
- Relate your understanding of intramembranous bone formation to the development of alveolar bone.
- Locate and identify the three aspects of the alveolar process.
- Describe the cellular and structural relationship between cementum, periodontal ligament, and alveolar bone.

- State the significance of interstitial space tissue.
- Identify the factors related to the eruption process.
- Describe the sequence of events in the pre-eruptive, pre-functional eruptive and functional eruptive stages.
- Describe the relationship between eruption and exfoliation of primary teeth and the eruption of permanent teeth.
- Use panoramic radiographic views of mixed dentition to gain understanding of the relationship and eruption sequence of primary and permanent teeth.

Unit 5 (Head/Neck): Fascia and Spaces; Spread of Infections; Anatomy of Local Anesthesia

- Understand the function of the lymphatics.
- Know the structural aspect of lymphatic vessels that control flow of fluid.
- Describe the lymph nodes of a healthy individual.
- Know into what lymph nodes all the facial nodes drain.
- Know into what lymph nodes all the deep nodes of the head drain.
- Describe lymphadenopathy and how it relates to the lymphatics.
- Describe metastasis and the role of the primary and secondary nodes.
- Describe nodes with cancer.
- Describe nodes with acute infection.
- Describe fascia and its function.
- Explain what it is that makes up deep fascia and where it comes from.
- Explain which space of the head and neck where dental infections are the most dangerous.
- Compare normal flora with pathogens.
- Understand a primary dental infection and be able to give an example.
- Understand a secondary dental infection and be able to give an example.
- Know what serves as barriers to the spread of dental infections.
- Relate the problem of opportunistic infections to medically compromised patients.
- List the ways that dental infection can spread.
- Compare secondary sinusitis to primary sinusitis.
- Understand how the spread of oral infection occurs when pathogens travel through the blood stream.
- Know which sinus is likely to be involved in the possible fatal spread of dental infections.
- Understand why a bacteremia is a serious problem in some patients.
- Outline the general pathway for a dental infection in a tooth. Outline the specific pathway of infection for both the anterior and posterior teeth in each arch.
- Understand what dental professionals can do to prevent the spread of dental infections.
- Discuss the link between systemic diseases and dental infections.
- Compare local infiltration with nerve block local anesthesia.
- Compare the effectiveness of maxillary anesthesia with the effectiveness of mandibular anesthesia.
- Compare the effectiveness of mandibular injections with the effectiveness of maxillary injections.
- Understand the effectiveness of infiltration in the mandible. Which portions of the mandible are most effective using infiltration?
- Understand the area anesthetized, the target and injection site, symptoms, possible complications and how to avoid complications of the following blocks:

PSA; MSA; ASA; IO; GP; NP; AMSA; IA; Buccal; Mental; Incisive; Gow-Gates