The Muscular System: Head and Neck

A muscular system exercise using Visible Body's Anatomy & Physiology app

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This lab activity is aligned with Visible Body's Anatomy and Physiology app.

Learn more at visiblebody.com/professors

PRE-LAB EXERCISES

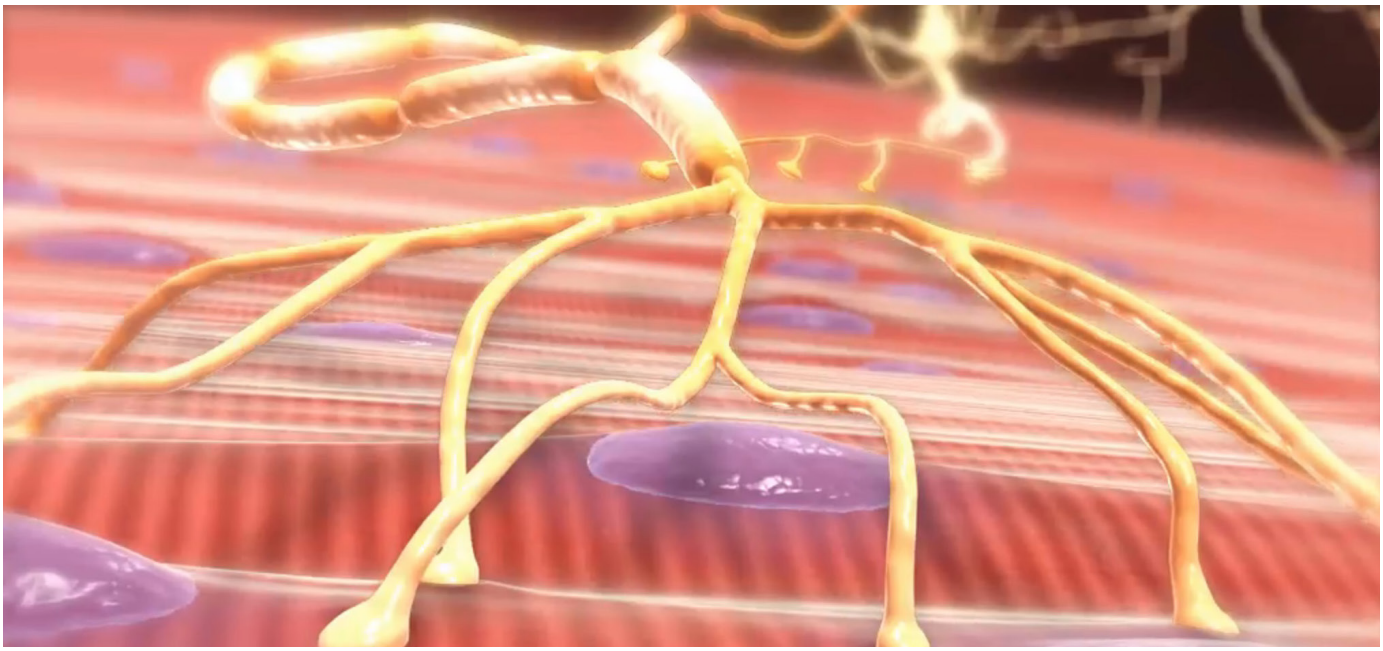
A. Watch the video 13.1 Muscular System Overview and observe the following:

1. What is the function of the muscular system?

2. How does a muscle change in order to accomplish its function?

3. What stimulates a muscle to contract?

B. Watch the video 14.2 Skeletal Muscle Function Overview and 14.3 Muscle Contraction: Action Potential and observe the following:



1. What is the initial stimulus for muscle contraction?

2. Which neurotransmitter is released at the neuromuscular junction after the action potential arrives?

3. When receptors open at the neuromuscular junction, does sodium travel in or out of the muscle fiber?

4. The action potential continues to travel down the muscle fiber on which structures? Which ion is released from the sarcoplasmic reticulum as this happens?

5. Draw and label a sketch of the neuromuscular junction in the space below.

C. Watch the video 14.4 Muscle Contraction: Cross Bridge Formation and answer the following:

1. What is the basic functional unit of a muscle fiber?

2. Thick filaments are composed of _____ and thin filaments are composed of _____.

3. When calcium is released from the sarcoplasmic reticulum, where does it bind?

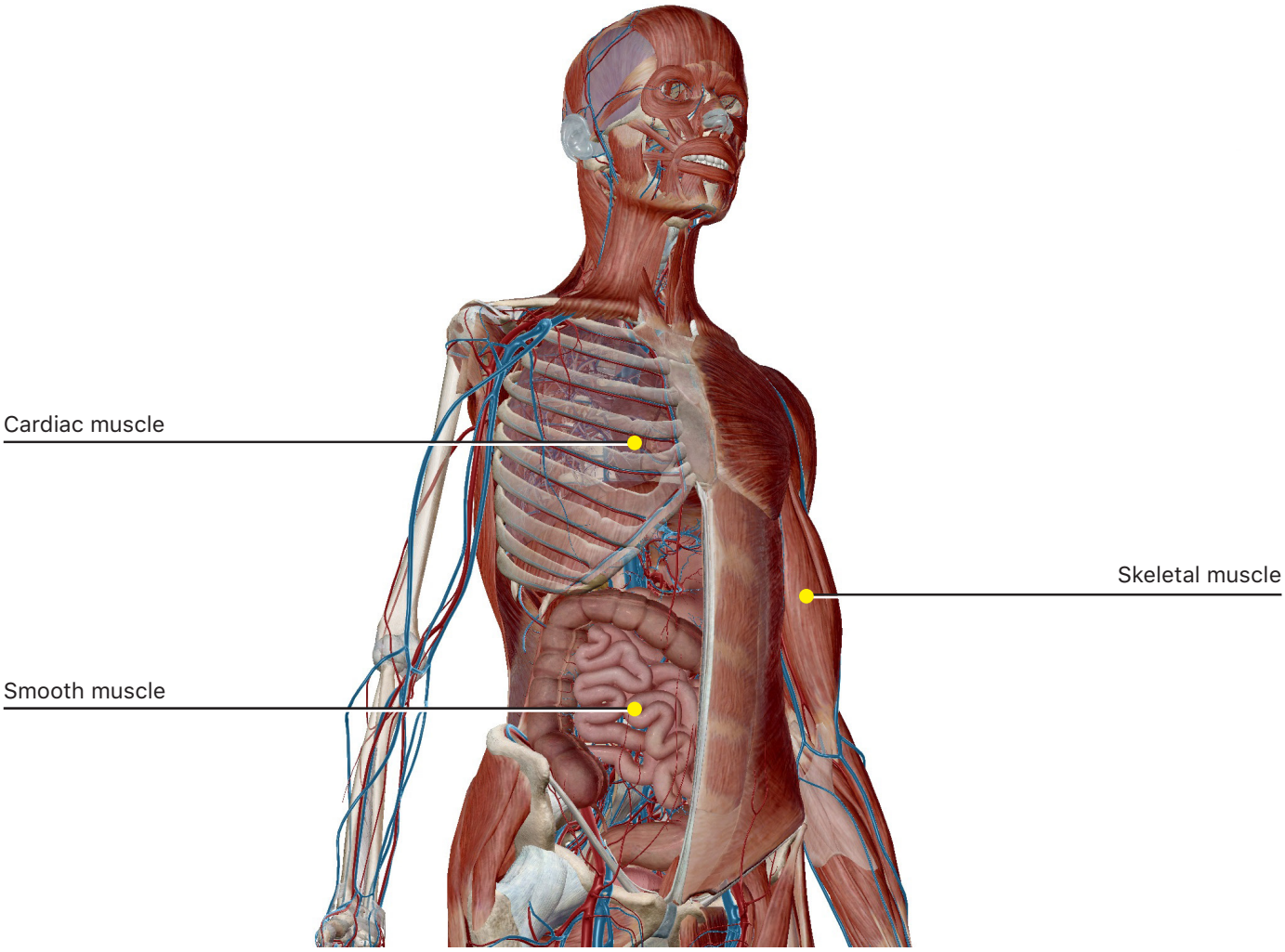
4. When a myosin head binds to actin, it forms a _____.

5. When a myosin head moves the actin toward the center of the sarcomere, this is called the _____.

6. What is the energy source that powers muscle contraction?

7. As myosin filaments pull the actin filaments toward the center of the sarcomere, will the muscle lengthen or shorten?

D. Observe the locations and structures of skeletal, cardiac, and smooth muscle in 13.2 Muscle Types and in 13.3 Types of Muscle Tissue.



1. Where can you expect to find each type of muscle tissue?

Skeletal Muscle	Cardiac Muscle	Smooth Muscle

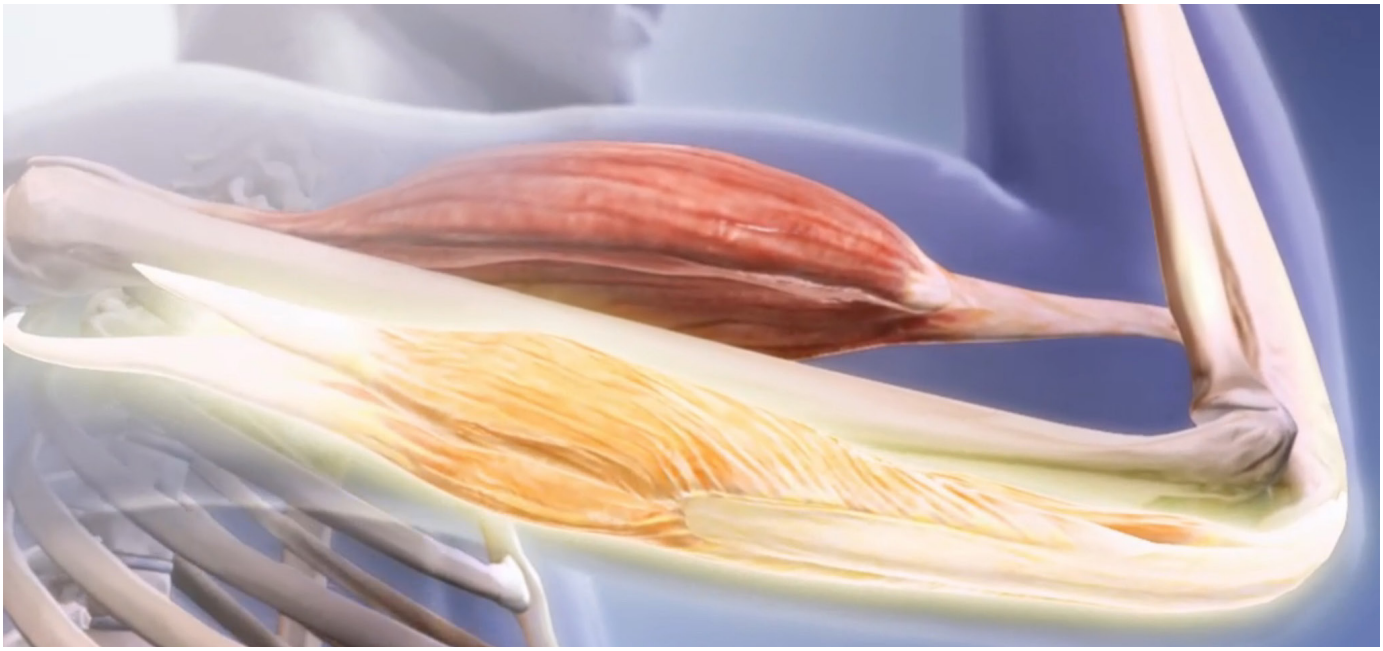
2. What are the structural characteristics of each type of muscle fiber?

	Skeletal Muscle	**Cardiac Muscle**	**Smooth Muscle**
Uninucleate or multinucleate?			
Branched fibers?			
Striated?			
Unique Structures			

3. Use the space below to draw and label examples of each type of muscle fiber.

Skeletal Muscle	**Cardiac Muscle**	**Smooth Muscle**

E. Watch the video 16.1 Muscle Interactions and answer the following:

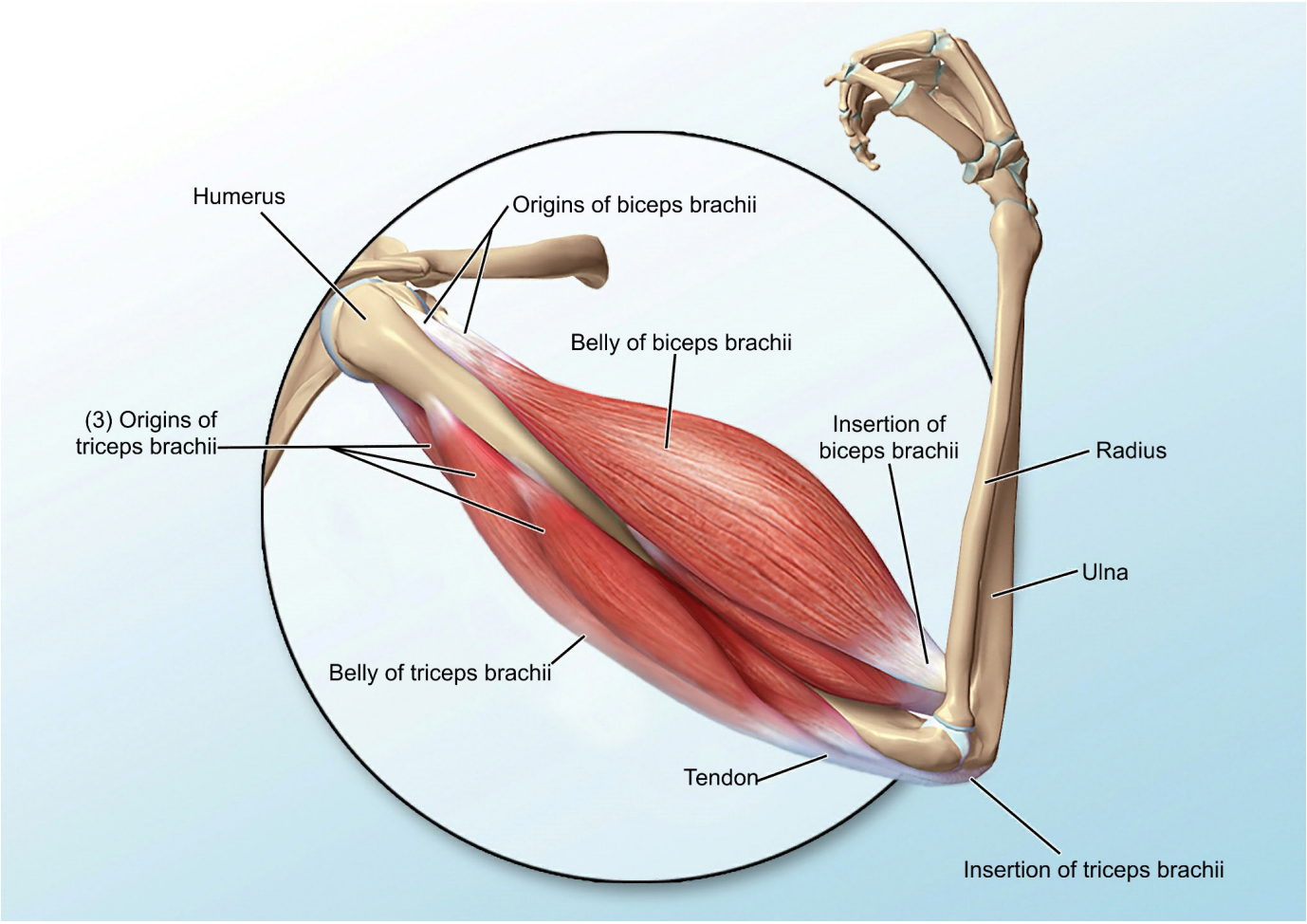


1. Define agonist.

2. Define antagonist.

3. When an agonist is contracting, the antagonist is _____.

F. Study the image 16.2 Skeletal Muscle Attachments and observe the following:



1. What structure attaches a skeletal muscle to a bone?

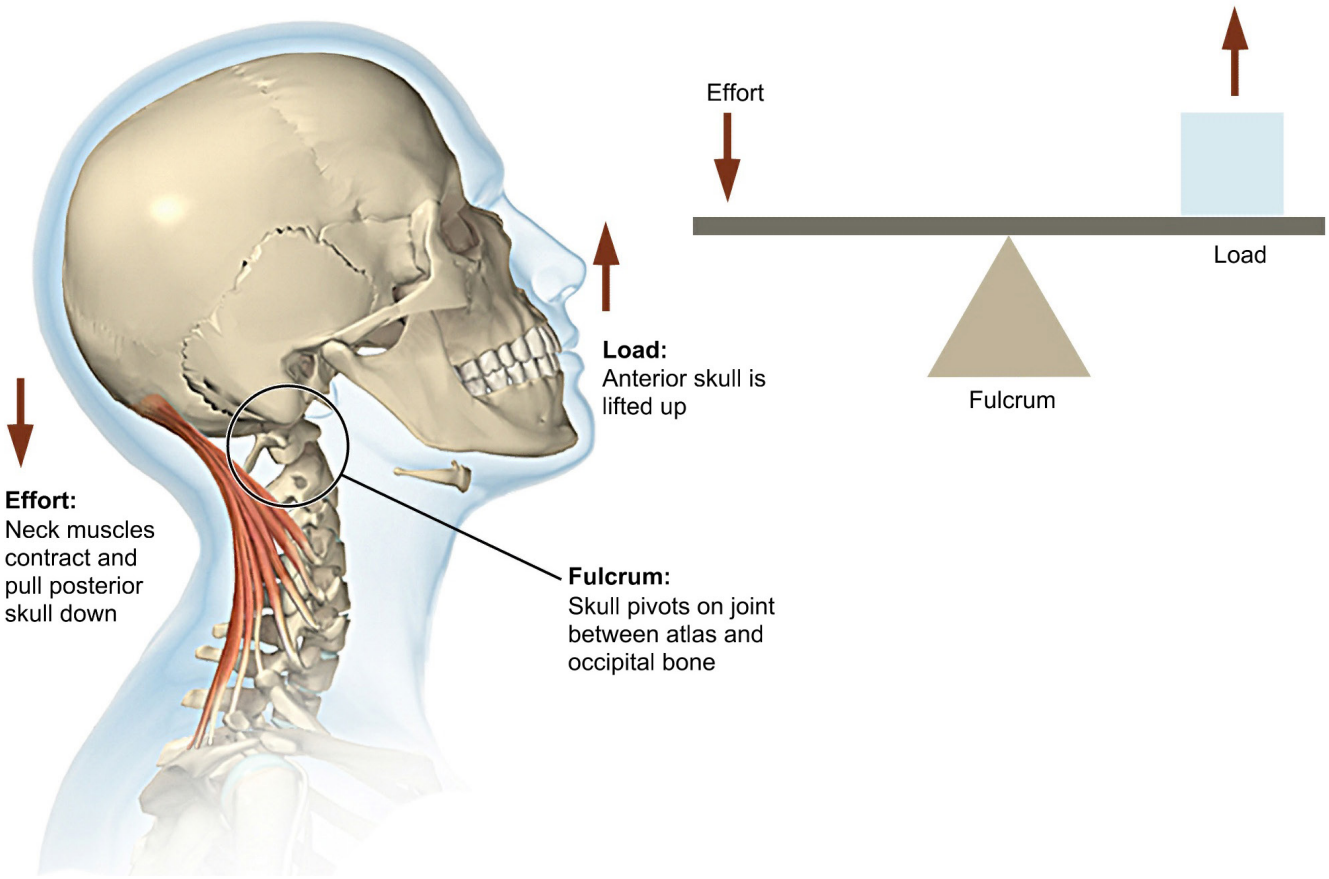
2. Define origin.

3. Define insertion.

4. When a muscle contracts, what happens to its length?

5. When a muscle contracts, the bone attached to which end of the muscle will move?

G. Study the image 16.3 Chin Raise: Muscles as First-Class Levers and answer the following:



1. How do the skeletal and muscular systems work together to produce leverage?

2. In a first-class lever, where is the fulcrum located in relation to the effort and the load?

3. What provides the effort in the chin raise movement?

4. What is the load that is moved in the chin raise movement?

IN-LAB EXERCISES

Use the following modules in Visible Body's Anatomy & Physiology app to guide your exploration of the head and neck region of the muscular system. As you explore the modules, locate the muscles on any charts, models or specimen available. Please note that these muscles act on the head and neck – those that are located in the neck but act on the back are in a separate section.

When reviewing the action of a muscle, it will be helpful to think about where the muscle is located and where the insertion is. Muscle physiology requires that a muscle will "pull" instead of "push" during contraction, and the insertion is the part that will move. Imagine that the muscle is "pulling" on the bone or tissue it is attached to at the insertion.

You may access 3D views through Visible Body's A&P app, and manipulate the images to see different views and isolate each muscle. Be sure to select the book icon under the structure name to read information specific to that muscle.

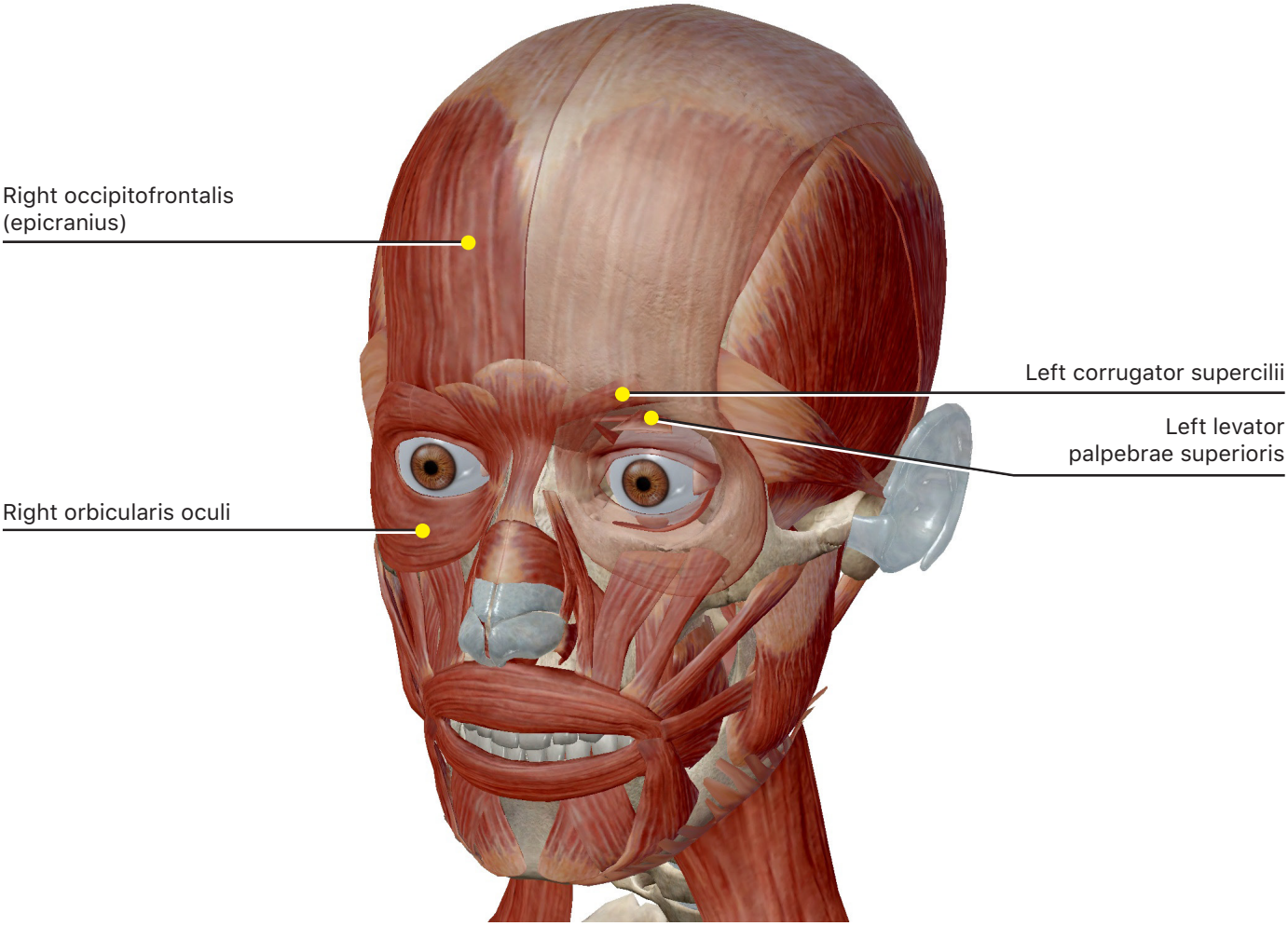
In each module, identify the following:

- Muscle location
- Origin(s) and insertion(s)
- Muscle action
- Nerve supply

A. Muscles of Facial Expression

View Module 16.6 Facial Expression: Scalp and Eyebrow.

These muscles insert into the skin of the face in order to create facial expressions. The specific insertion will determine what type of expression each muscle makes.

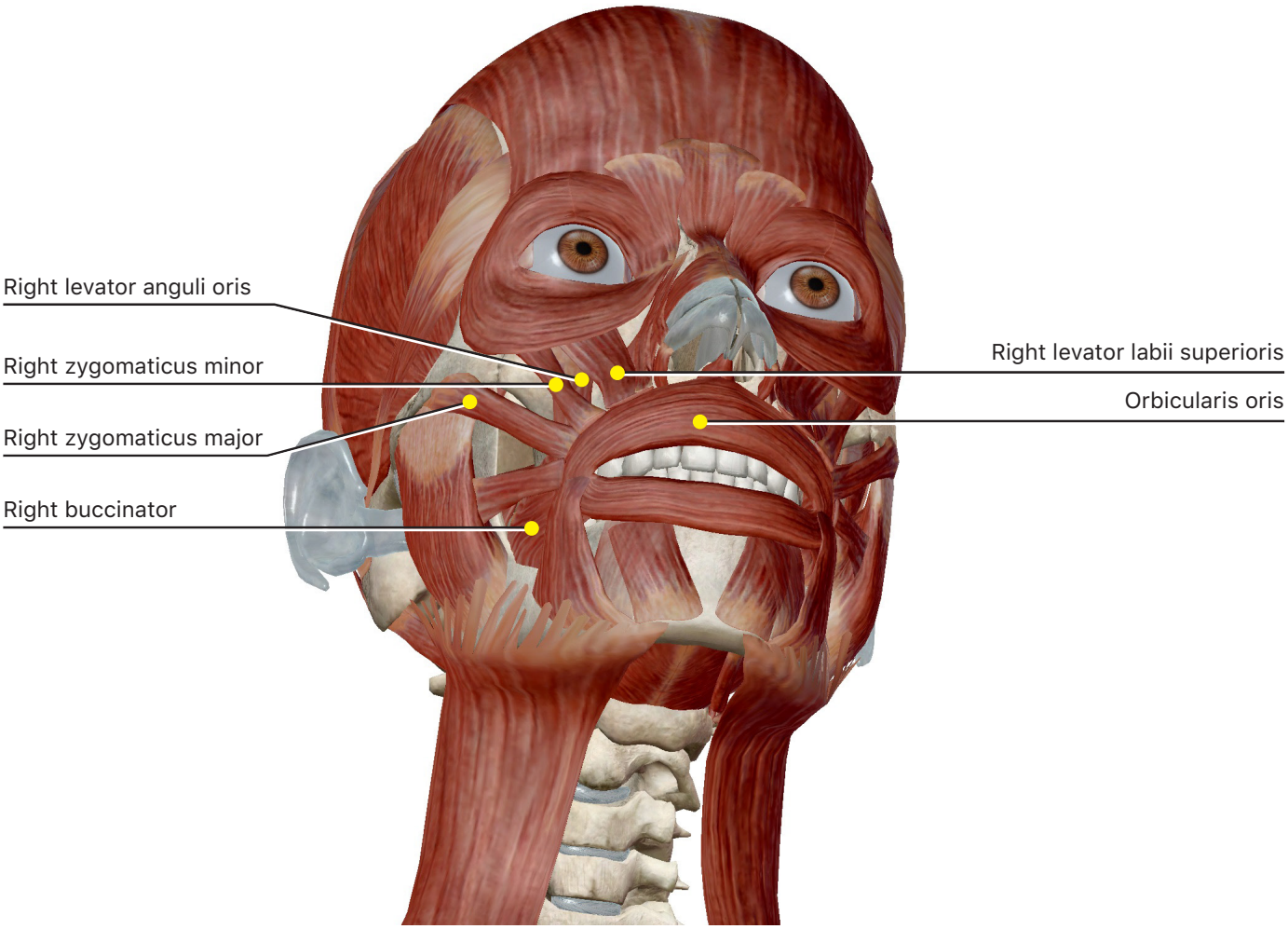


Facial Expression				
Muscle	**Origin**	**Insertion**	**Action**	**Innervation**
Occipitofrontalis (epicranius)				
Corrugator supercilii				
Levator palpebrae superioris				
Orbicularis oculi				

B. Muscles of the Upper Mouth

View Module 16.7 Facial Expression: Upper Mouth.

Many different muscles are necessary to manipulate the mouth for speech, eating, whistling, and other actions. These muscles originate in different places, but insert on the mouth. As you study these muscles, imagine the muscle pulling on the mouth – the angle where the muscle attaches to the mouth will determine how the mouth moves. Muscles located above the mouth will pull the mouth upward.

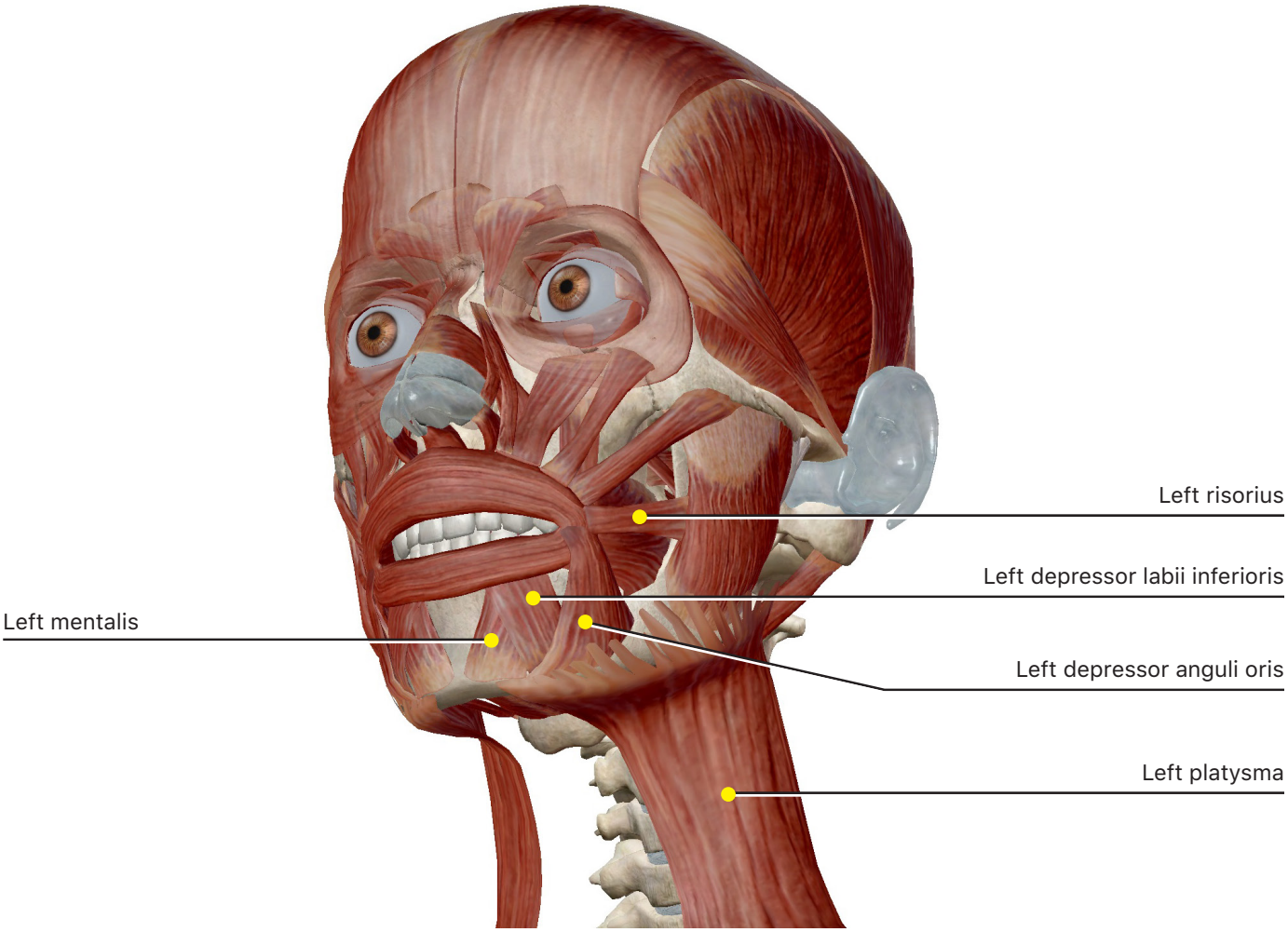


Upper Mouth				
Muscle	**Origin**	**Insertion**	**Action**	**Innervation**
Orbicularis oris				
Zygomaticus major				
Zygomaticus minor				
Levator labii superioris				
Levator anguli oris				
Buccinator				

C. Muscles of the Lower Mouth

View Module 16.8 Facial Expression: Lower Mouth

Use the same reasoning as with the muscles of the upper mouth to study these muscles. Since these muscles are located under the mouth, the mouth will be pulled downward or laterally when these muscles contract.

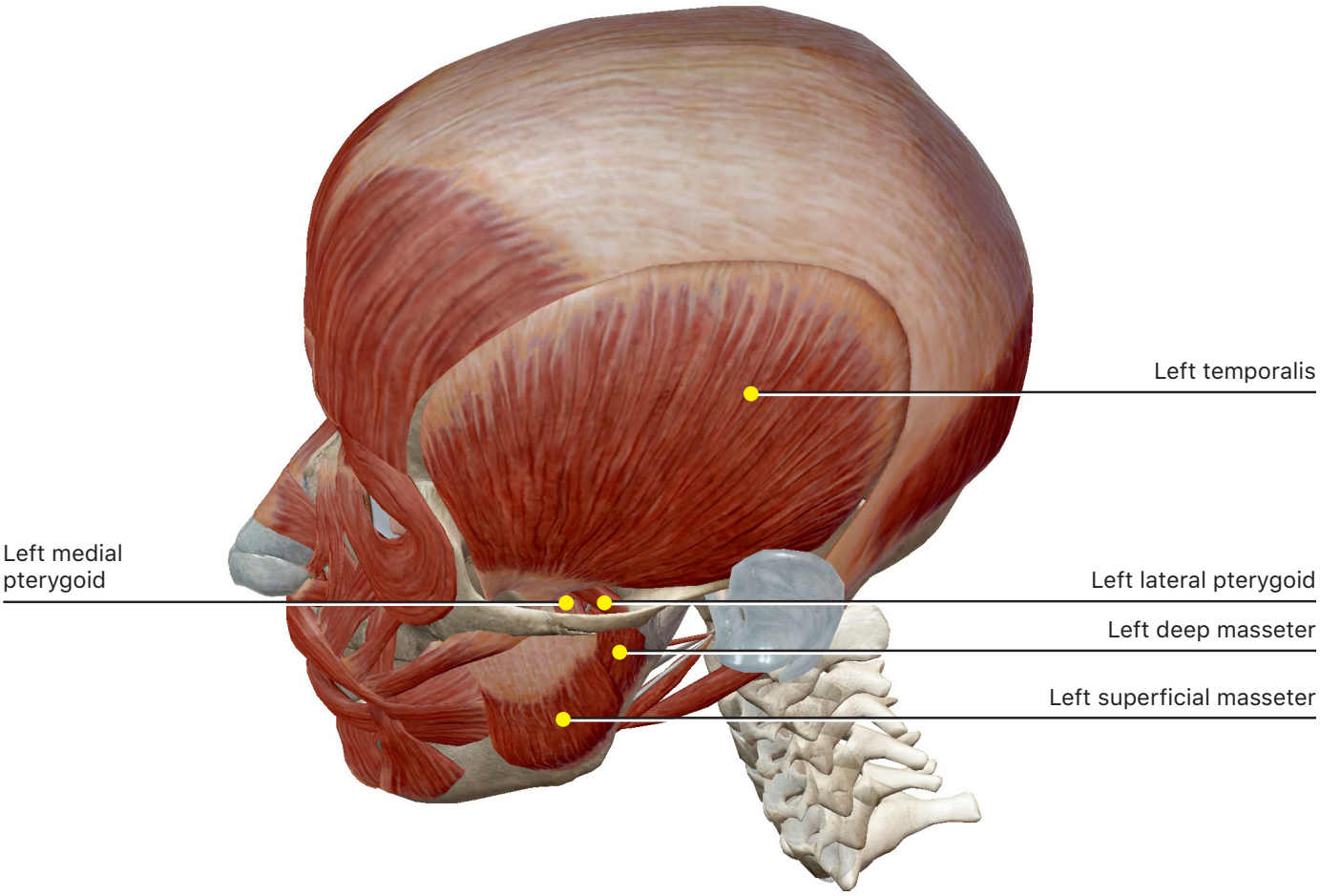


Lower Mouth				
Muscle	**Origin**	**Insertion**	**Action**	**Innervation**
Depressor anguli oris				
Depressor labii inferioris				
Risorius				
Mentalis				
Platysma				

D. Muscles of Mastication

View Module 16.10 Mastication

These are the muscles involved in chewing food. Consider the different ways food may be manipulated in the mouth as you study these muscles.

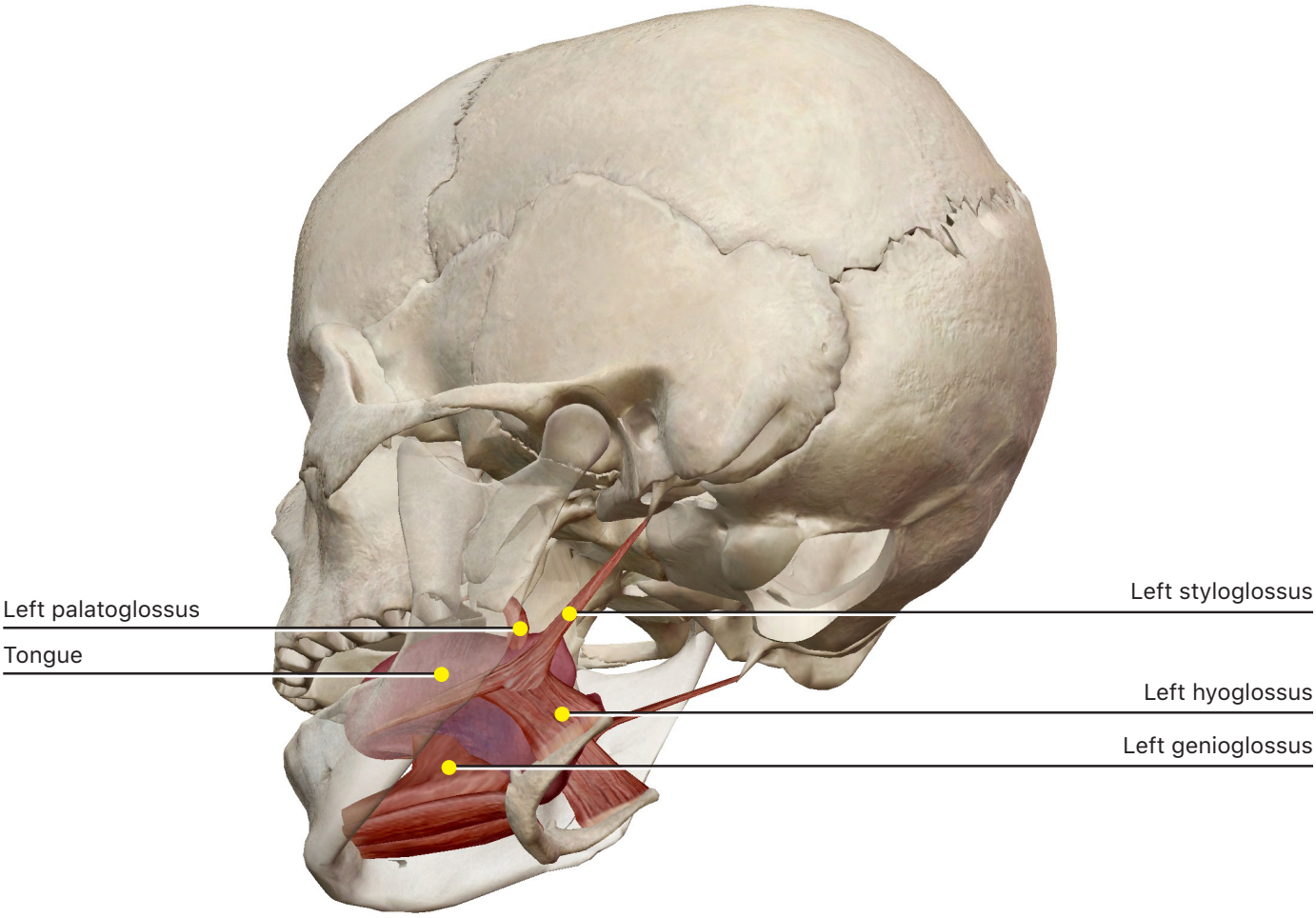


Muscles of Mastication				
Muscle	**Origin**	**Insertion**	**Action**	**Innervation**
Deep masseter				
Superficial masseter				
Temporalis				
Medial pterygoid				
Lateral pterygoid				

E. Muscles That Act On the Tongue

View Module 16.11 Tongue

In addition to the tongue itself, several other muscles are used in moving the tongue around the mouth to manipulate food.

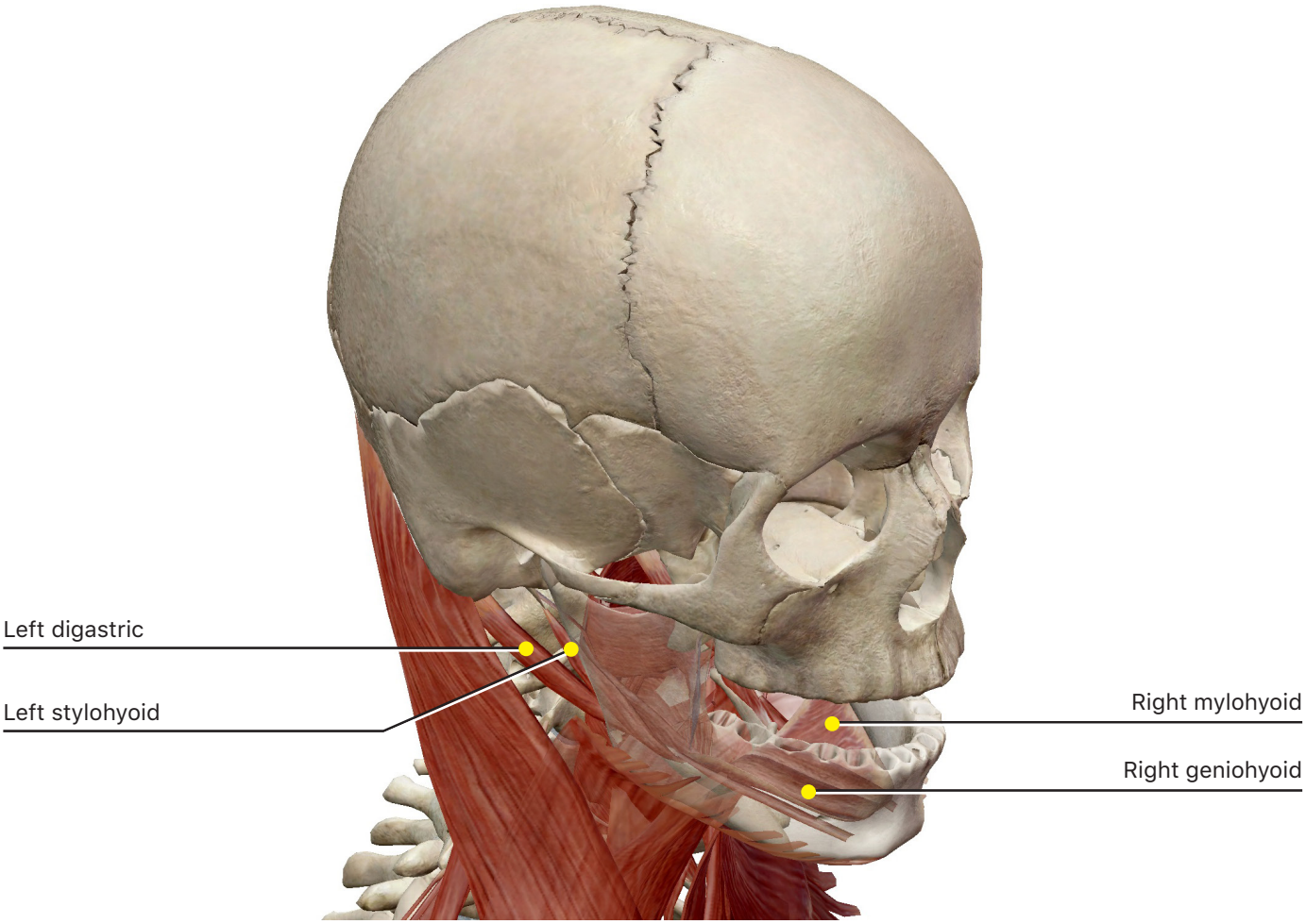


Tongue				
Muscle	**Origin**	**Insertion**	**Action**	**Innervation**
Genioglossus				
Hyoglossus				
Palatoglossus				
Styloglossus				
Tongue				

F. Suprahyoid Muscles

Module 16.12 Neck: Suprahyoid

These muscles are located superior to the hyoid bone, which does not articulate with any other bone in the body. These muscles participate in swallowing and moving the mandible.

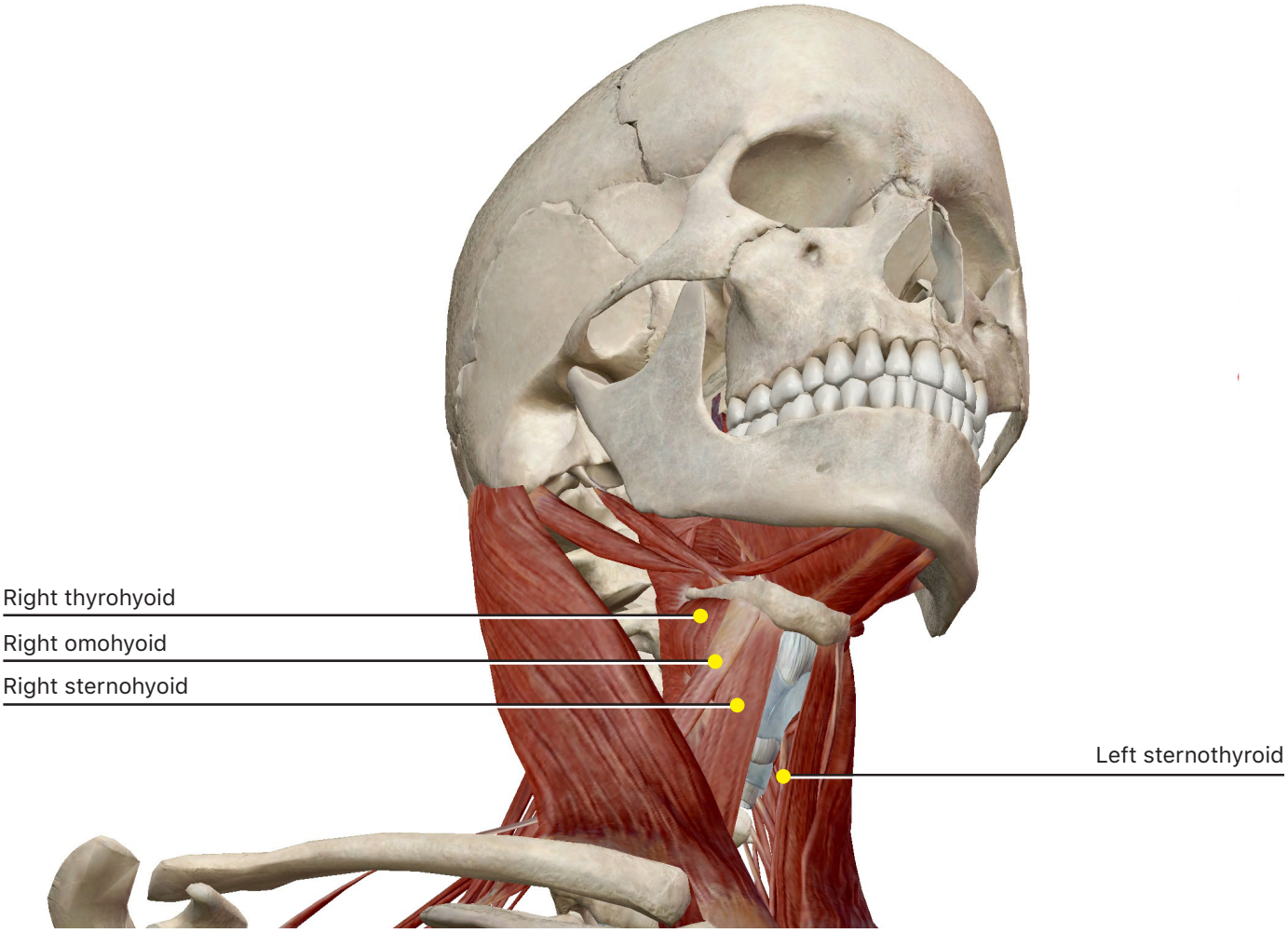


Suprahyoid Muscles				
Muscle	**Origin**	**Insertion**	**Action**	**Innervation**
Digastric				
Stylohyoid				
Mylohyoid				
Geniohyoid				

G. Infrahyoid Muscles

Module 16.13 Neck: Infrahyoid

These muscles are located inferior to the hyoid bone, and serve to fix (immobilize) the hyoid bone while the suprahyoid muscles are contracting. They also play a role in vocalization in the larynx.

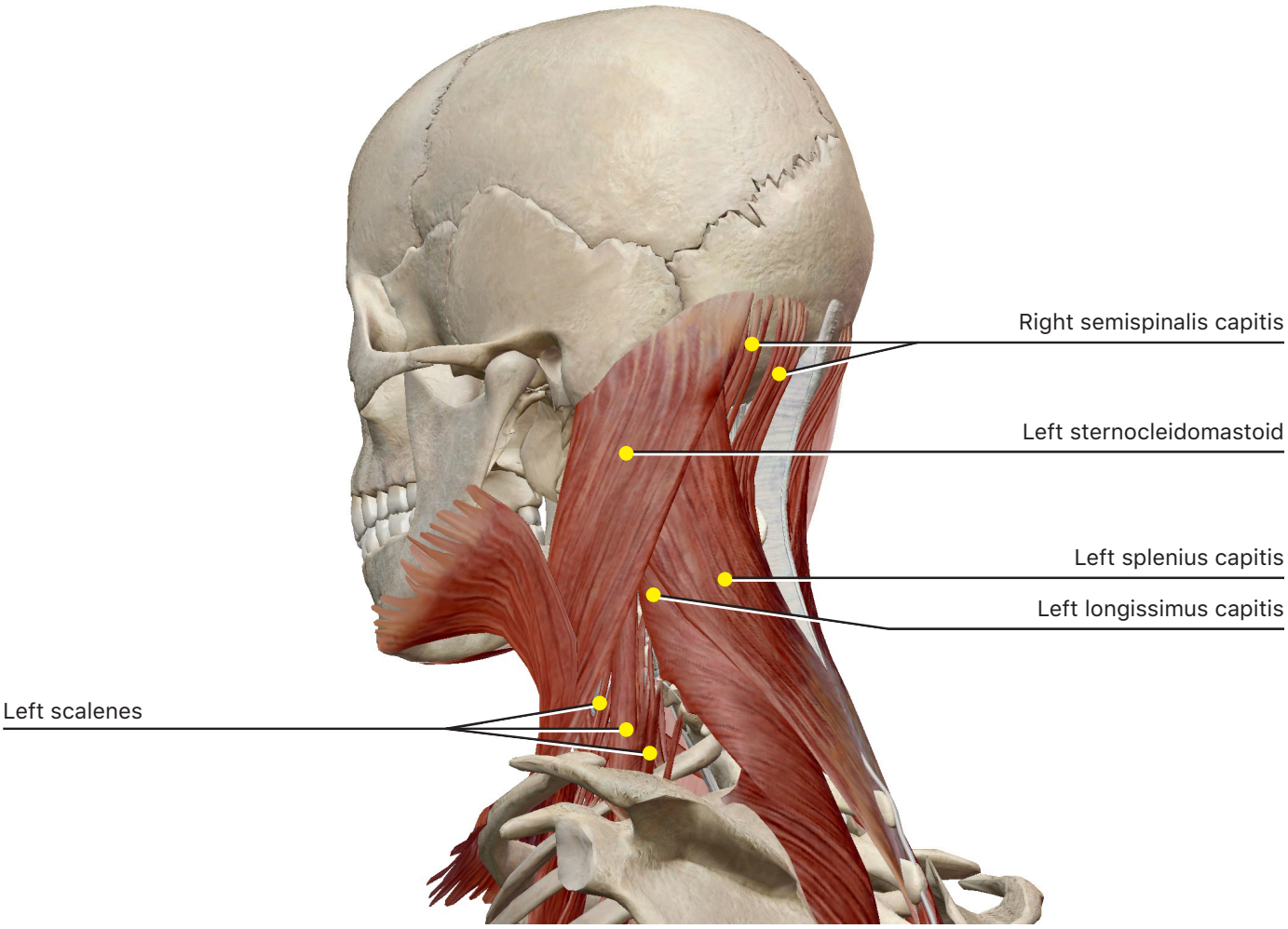


Infrahyoid Muscles				
Muscle	**Origin**	**Insertion**	**Action**	**Innervation**
Omohyoid				
Sternohyoid				
Sternothyroid				
Thyrohyoid				

H. Neck Muscles (that act on the head)

View Module 16.14: Neck: Head Movements

These muscles are located in the neck and move the head when they contract. It will again be helpful to pay careful attention to the location and insertion to understand the action of each muscle.



Suprahyoid Muscles				
Muscle	**Origin**	**Insertion**	**Action**	**Innervation**
Sternocleidomastoid				
Semispinalis capitis				
Splenius capitis				
Longissimus capitis				
Scalenes				

PUTTING IT ALL TOGETHER

1. Based on what you've learned about the muscles in this exercise, what do you think the following terms mean?

a. Major

b. Minor

c. Levator

d. Depressor

e. Capitis

2. Which muscles are used when performing the following actions?

a. Smiling

b. Frowning

c. Raising the eyebrows

d. Expressing surprise

e. Whistling

f. Chewing

g. Swallowing

h. Nodding the head “yes

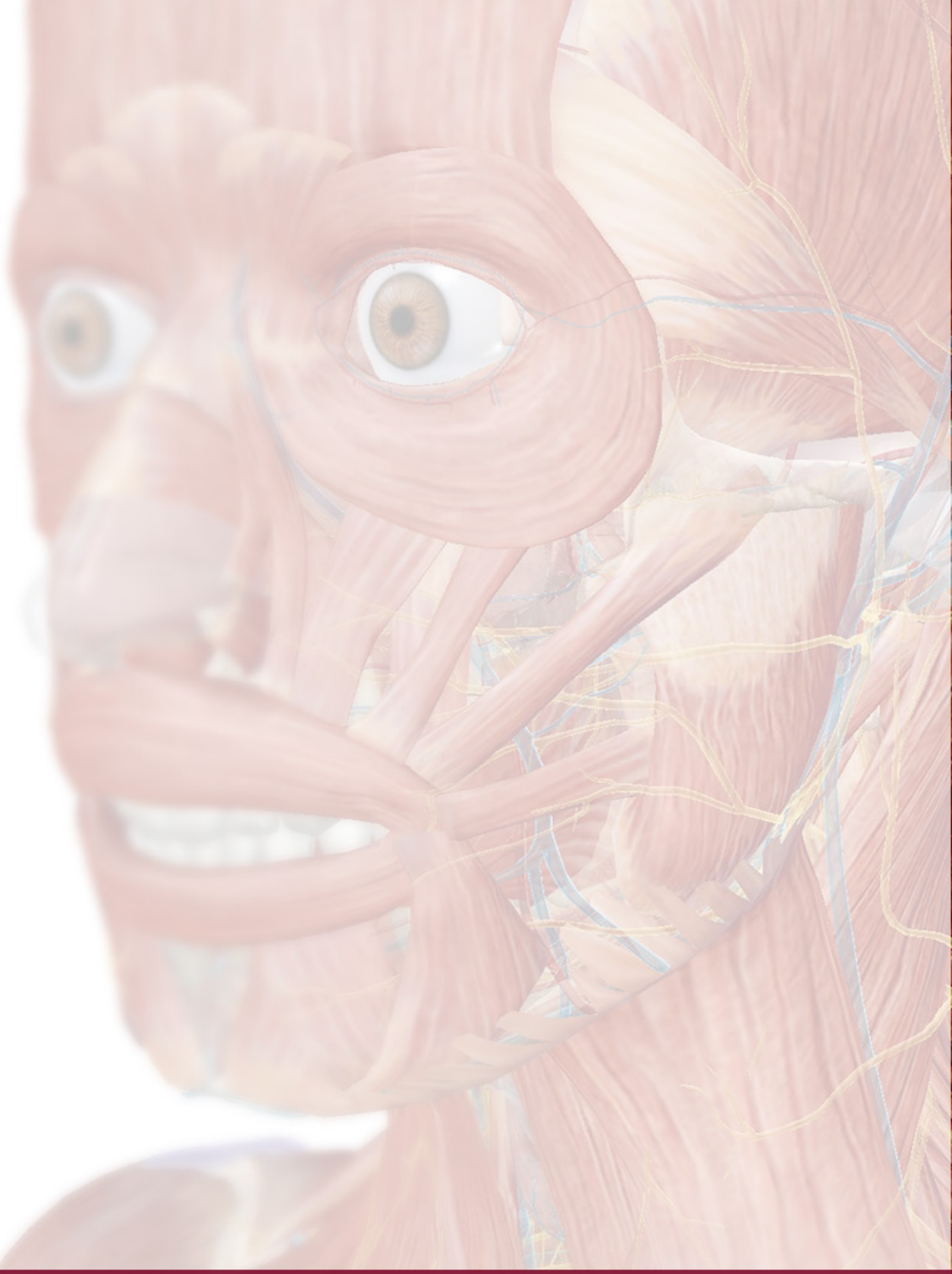
i. Shaking the head “no”

j. Tilting the head to look up toward the sky

k. Tilting the head to the side (bring the ear to the shoulder)

3. Bell’s Palsy results from damage to the facial nerves. If innervation to the facial nerves ceased, which muscles would be affected? Which actions of the face would be affected?

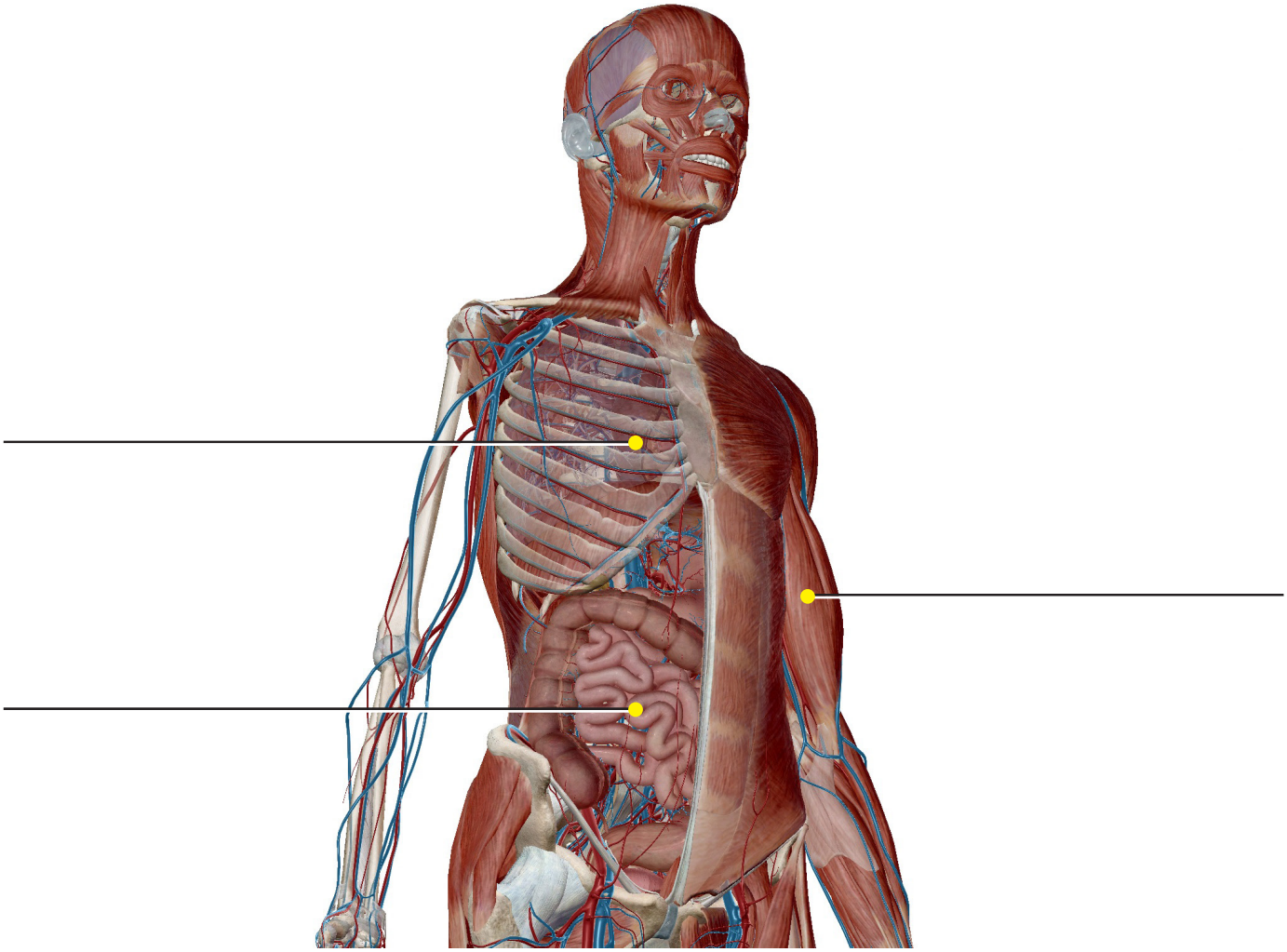
4. How are the suprahyoid and infrahyoid muscles different from one another?



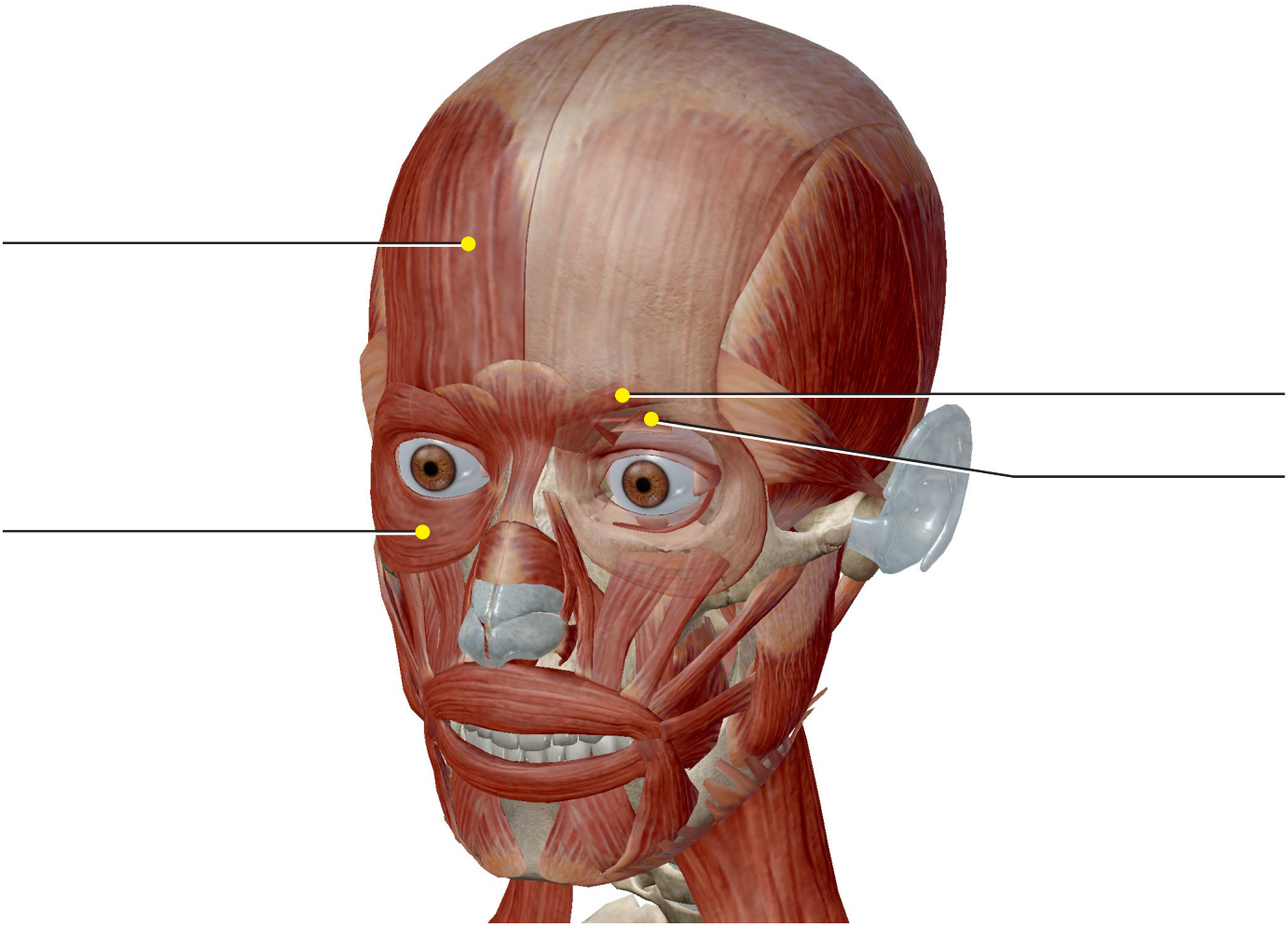
Student Practice

Label the muscles in the following figures

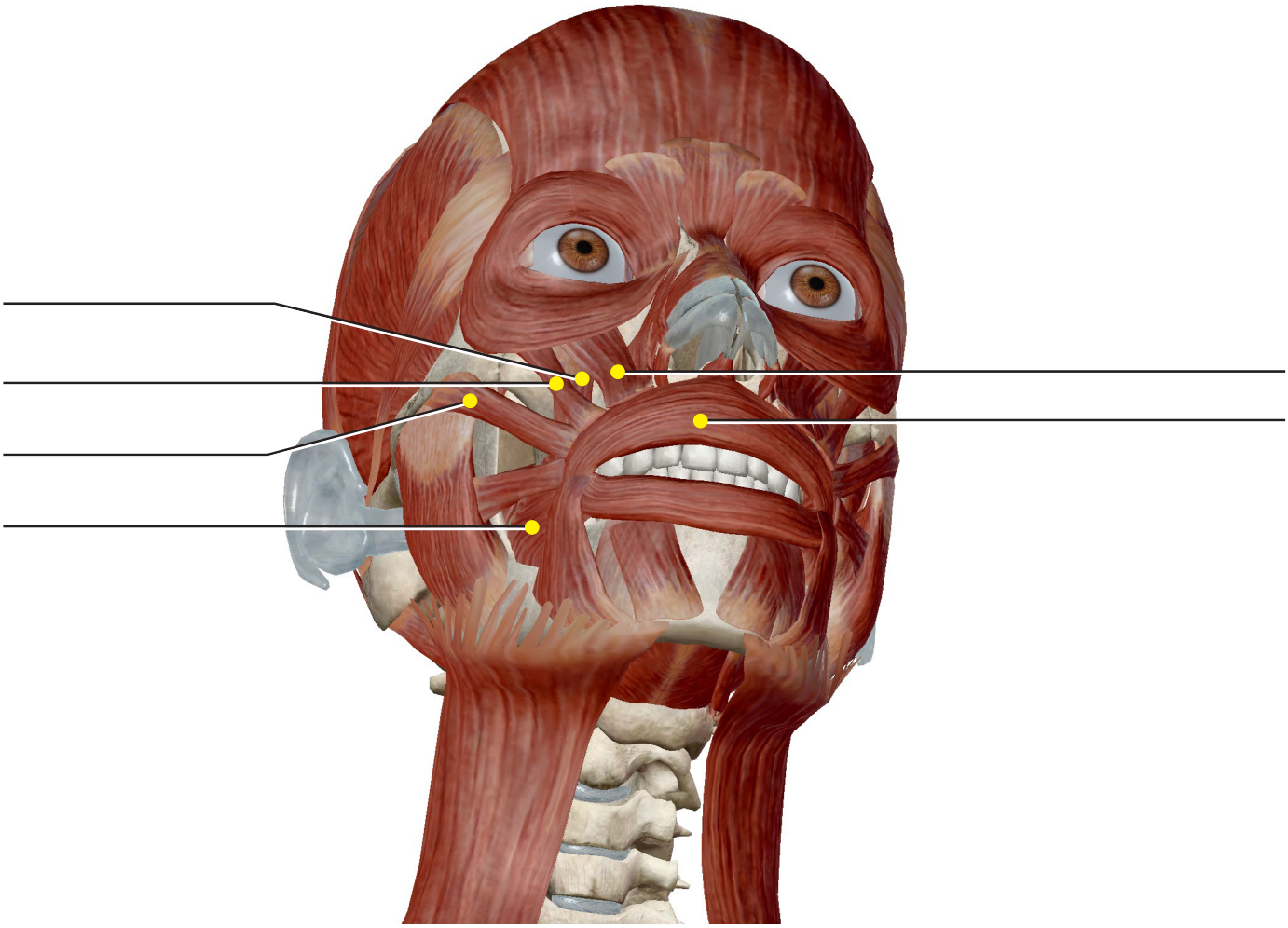
Types of Muscle Tissue



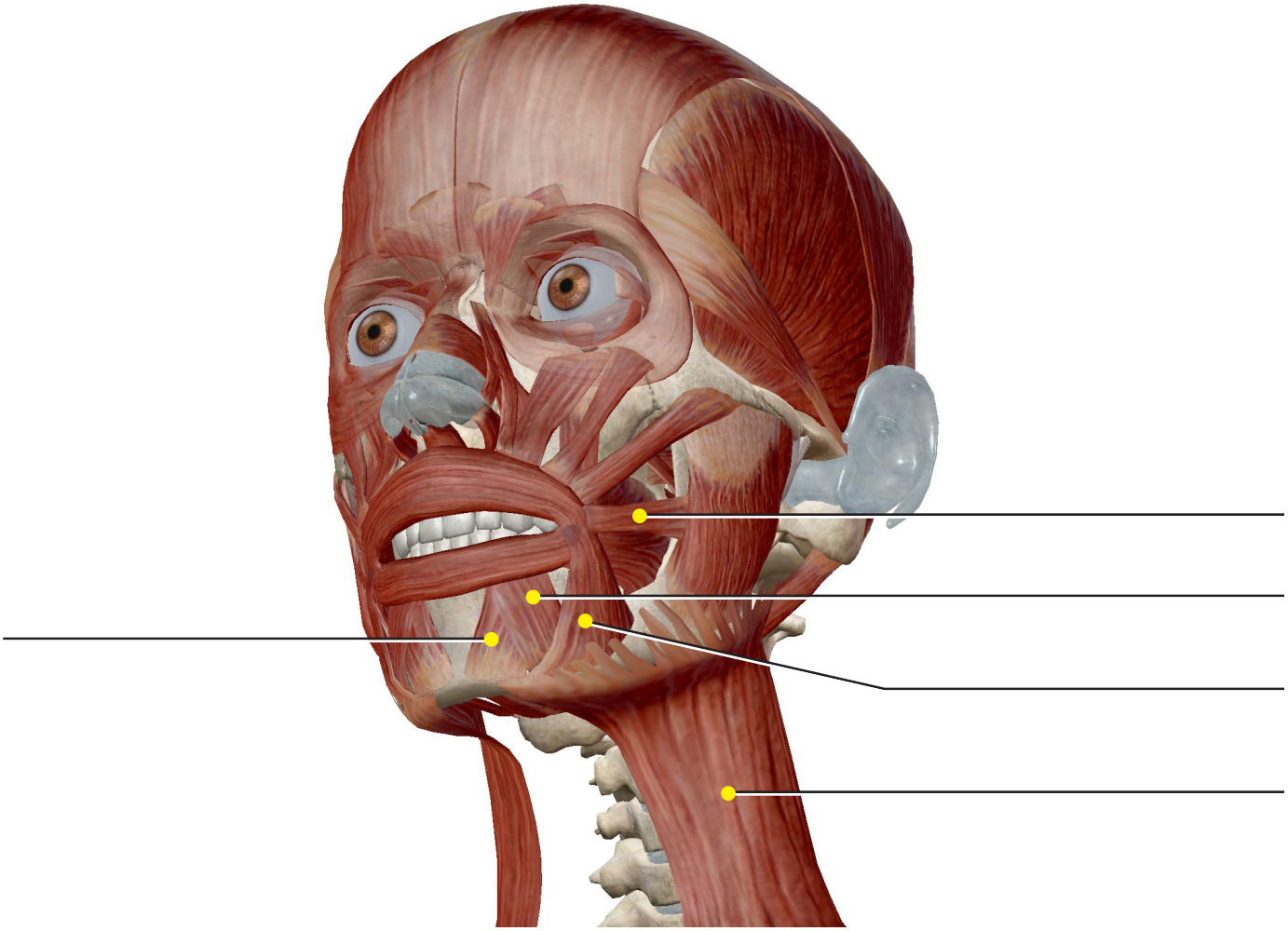
Facial Expression: Scalp and Eyebrow



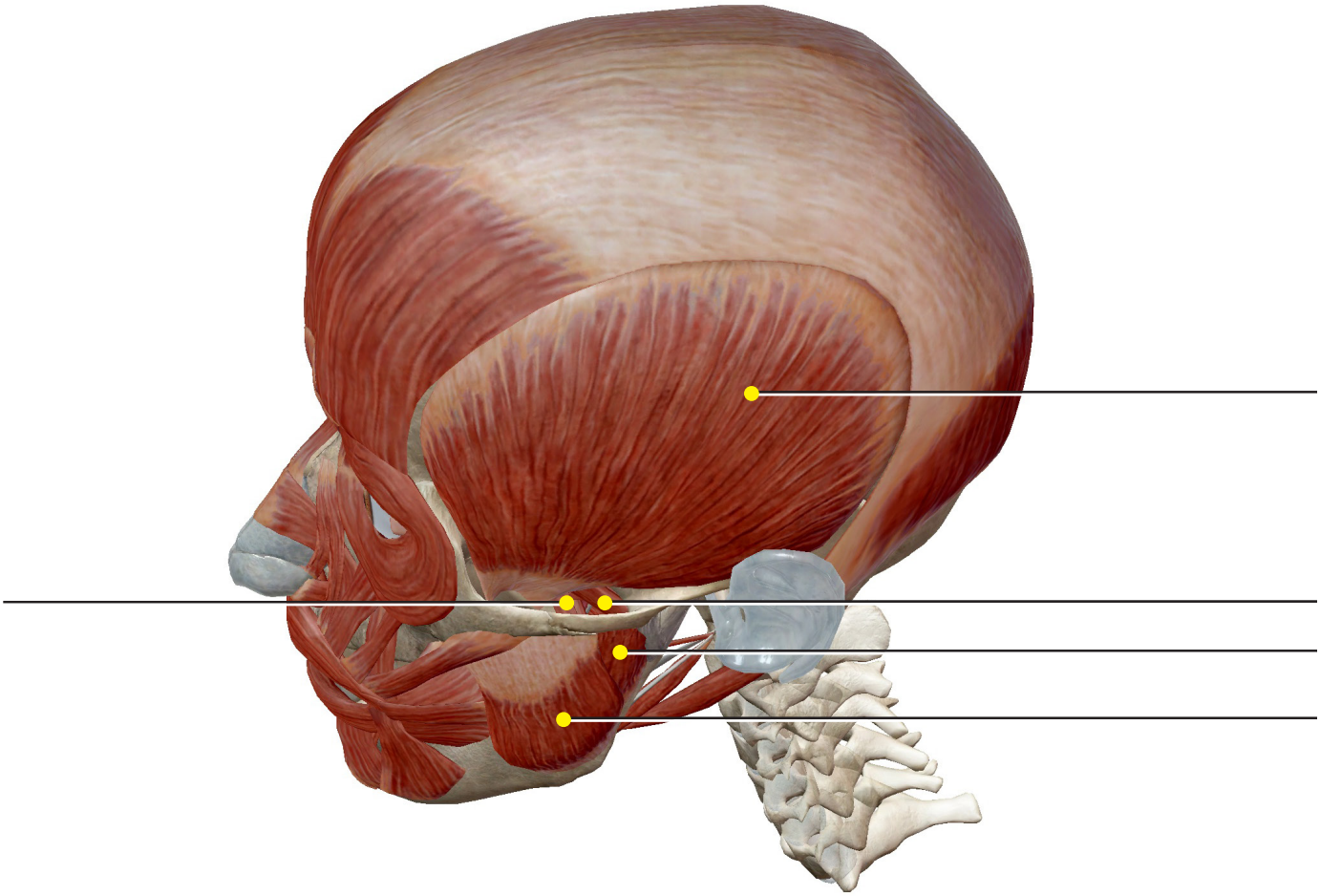
Facial Expression: Upper Mouth



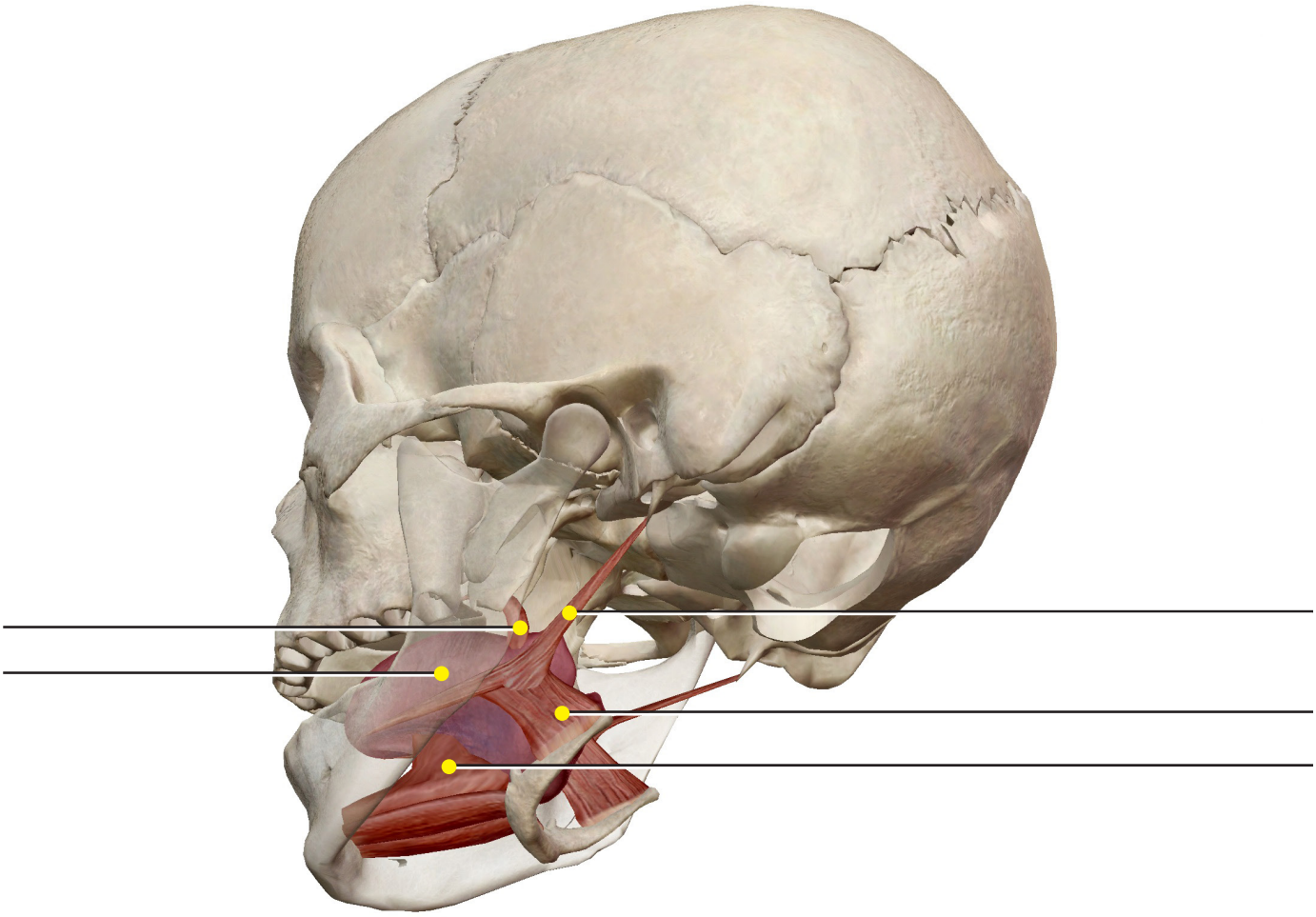
Facial Expression: Lower Mouth



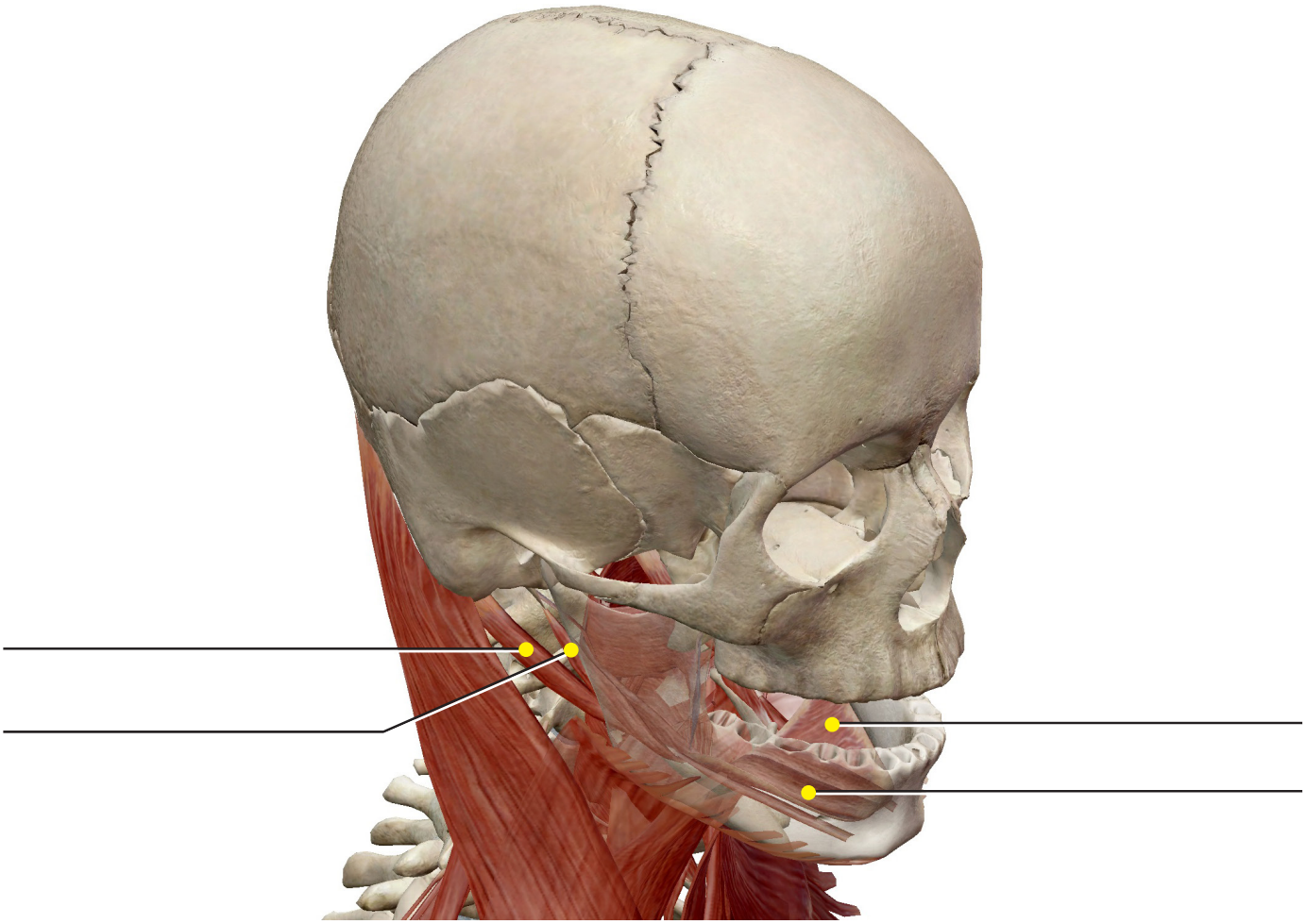
Muscles of Mastication



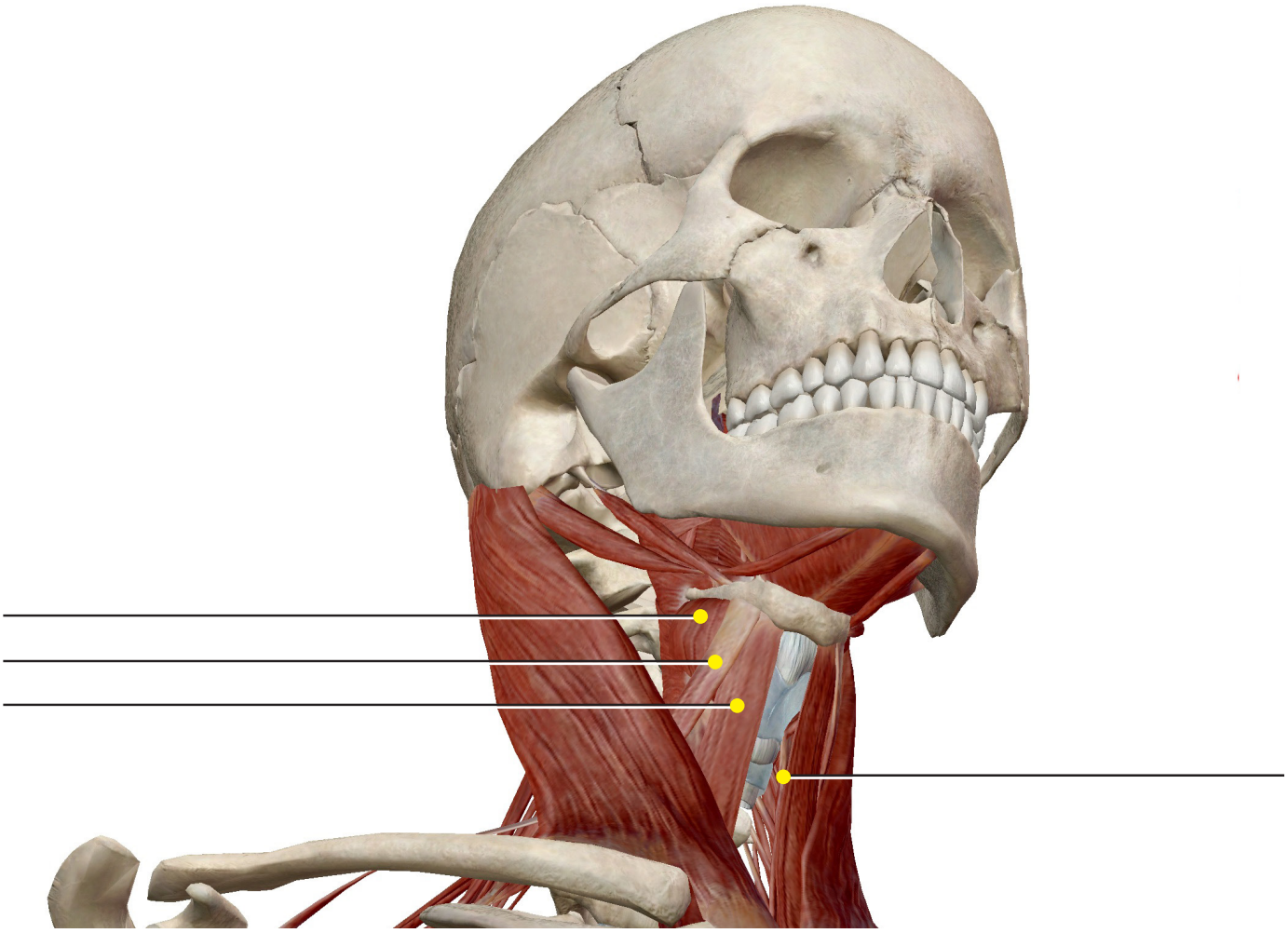
Muscles That Act On the Tongue



Suprahyoid Muscles



Infrahyoid Muscles



Neck Muscles (that act on the head)