

Muscles

Objectives

- Be able to identify and distinguish the three muscle types.
- Be able to identify several major muscles in your body.
- Predict the origin and insertion of muscles based on their action.

Introduction

The muscle system is used to move your body and move substances through your body. Different types of muscle tissue perform these different functions. Skeletal muscle tissue is attached to bones, moving your body while contractions of smooth and cardiac muscle tissue move substances through your body.

In the BiologyOne DVD, go to the Muscles simulation within the Mammalian Systems to complete this exercise.

Activity 33.1 **Muscle Tissues**

There are three general types of muscle tissues. These are smooth, cardiac and skeletal (also called striated). Each of these types of muscle tissue will contract when stimulated, however, the nature of that stimulation and the force of the contraction varies between them. From the introductory screen of the Muscle simulation in the BiologyOne DVD, click on the forward arrow to review the types of muscle tissues.

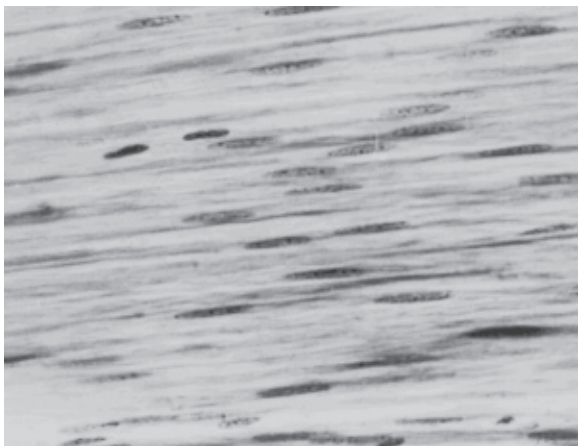
Smooth Muscle Tissue

Smooth muscle is under involuntary or autonomic nervous control. These muscles will contract without any conscious input. Smooth muscle is found in the walls of veins, arteries, digestive organs, and reproductive structures. There are very few sensory receptors in smooth muscle, which explains why you can't feel blood flowing or your stomach digesting food. Make drawings and label the cell membrane and the nucleus in the Results Section.

Cardiac Muscle Tissue

Click on the forward arrow in the lower right to view cardiac or heart muscle. Heart muscle is unique in that the heart itself can generate a contraction without nervous control. Heart muscle is also striated and has intercalated discs (areas where the cell membranes overlap). The cardiac fibers often branch. Make your drawing in the Results Section.

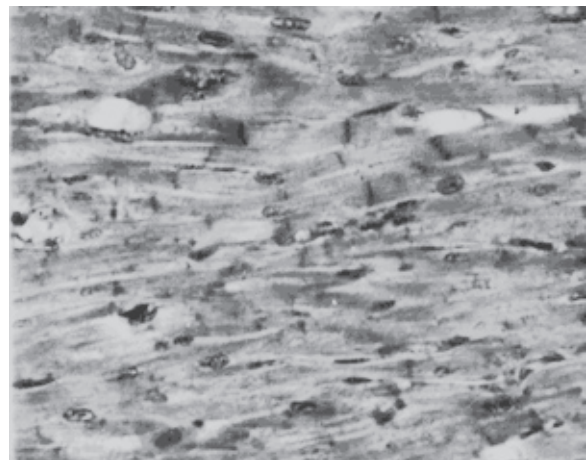
Micrograph of Smooth Muscle Tissue



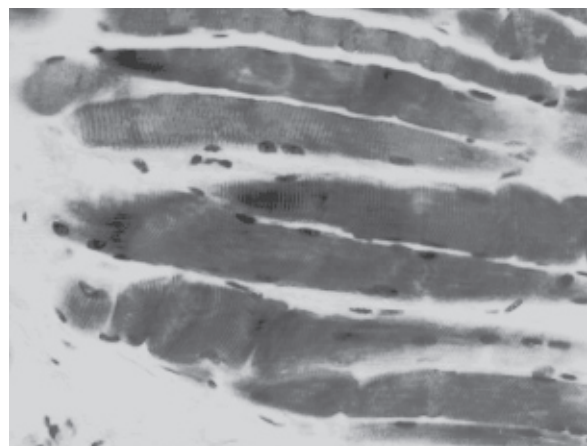
Skeletal Muscle Tissue

Study skeletal or striated muscle by clicking on the forward arrow in the lower right. This type of muscle is connected via tendons to the bones of your skeleton and is responsible for its movement. It is also striped or striated in appearance. This results from the overlap of protein filaments in the sarcomere. Skeletal muscle is under voluntary or somatic nervous control. Find a longitudinal section of a skeletal fiber and identify the striations and nuclei. Make a drawing of striated muscle in the Results Section.

Micrograph of Cardiac Muscle Tissue



Micrograph of Skeletal Muscle Tissue



Activity 33.2 Muscle Contraction

A muscle fiber contracts when the protein filaments, actin and myosin, slide across each other, increasing the overlap of the filaments. This is triggered by an influx of both calcium and magnesium ions and the presence of ATP (the energy transport molecule). In skeletal muscle, the actin and myosin filaments are arranged in microscopic, repeating units along the length of the muscle fiber. Each unit is called a sarcomere. An illustration of contraction of the sarcomere is shown in the Muscle simulation in the BiologyOne DVD.

Because muscles can only contract with force, they must be arranged in opposing pairs. When one muscle contracts, it stretches the opposing muscle, lengthening the sarcomeres. The contracting muscle is called the agonist. The opposing muscle that is being stretched or relaxed is called the antagonist. An illustration of this opposing arrangement of skeletal muscles is shown in the Muscle simulation in the BiologyOne DVD.

Activity 33.3 Muscles of the Body

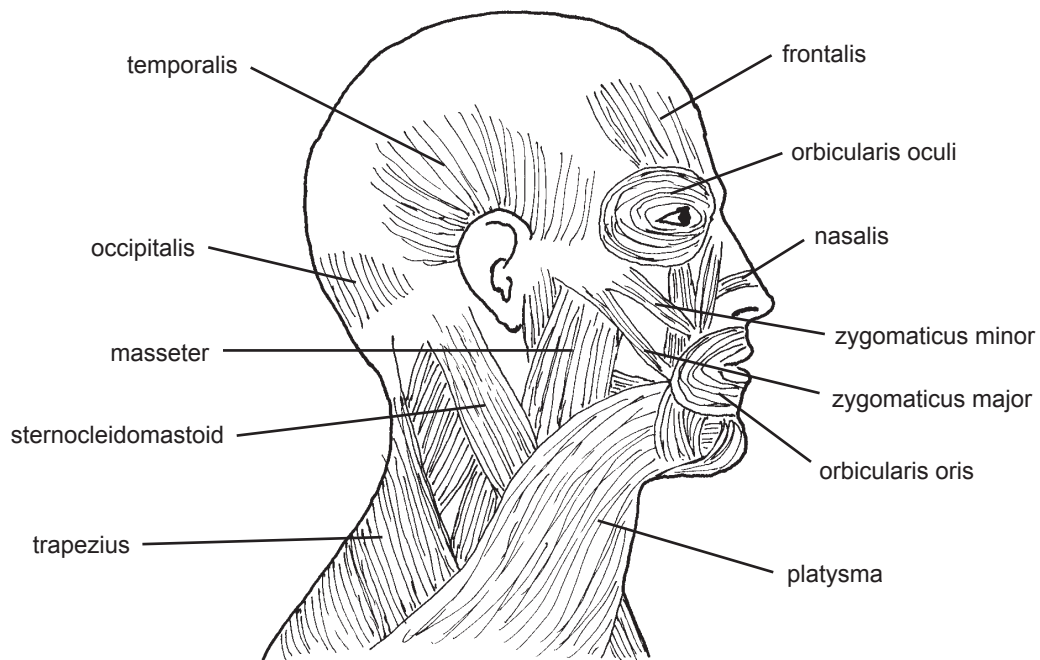
The fibers of skeletal muscles are arranged in groups that form distinct muscles. Using the Muscle simulation as a reference, label the muscles in the diagram in the Results Section. You should study these muscles and be able to name them at a later date.

Muscles are ordinarily attached to a stationary bone, the origin, and a movable bone, the insertion. For example, the pectoralis major, which draws your arm forward, has the sternum as its origin and the humerus as its insertion. Typically a muscle will span only one joint.

For each of the muscles listed in the chart in the Results Section, contract that muscle on your body and describe its function using the appropriate terms. Based on this function, predict the skeletal bones in which that muscle has its origin and insertion.

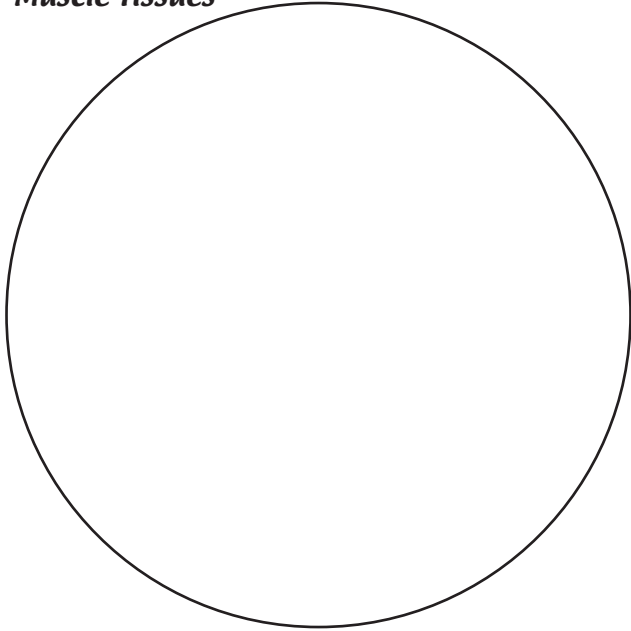
Typically many muscles will be used to create smooth body motions. Using the diagrams showing the muscles of the body and the illustration of the muscles of the face shown here, complete the table in the Results Section by predicting which muscles you use to complete the motions described.

Muscles of the Head and Face

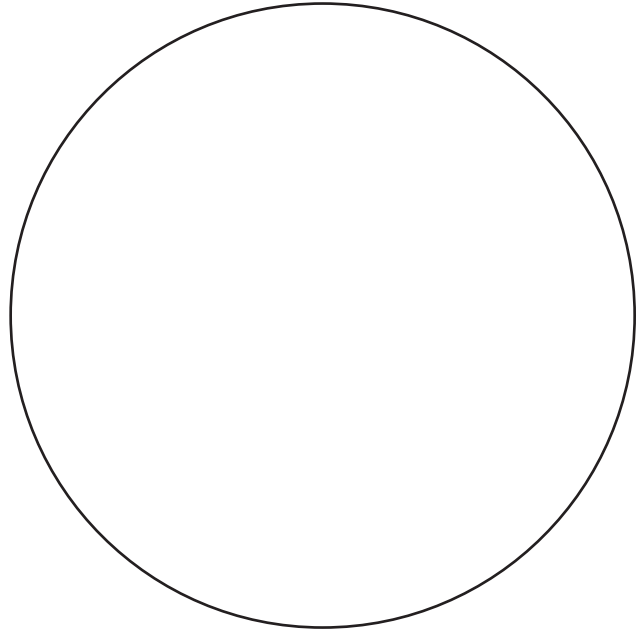


Results Section

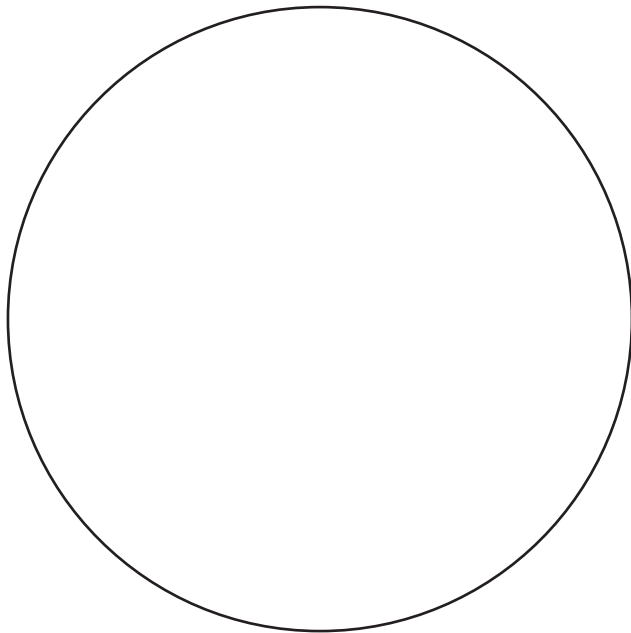
Activity 33.1
Muscle Tissues



smooth muscle tissue

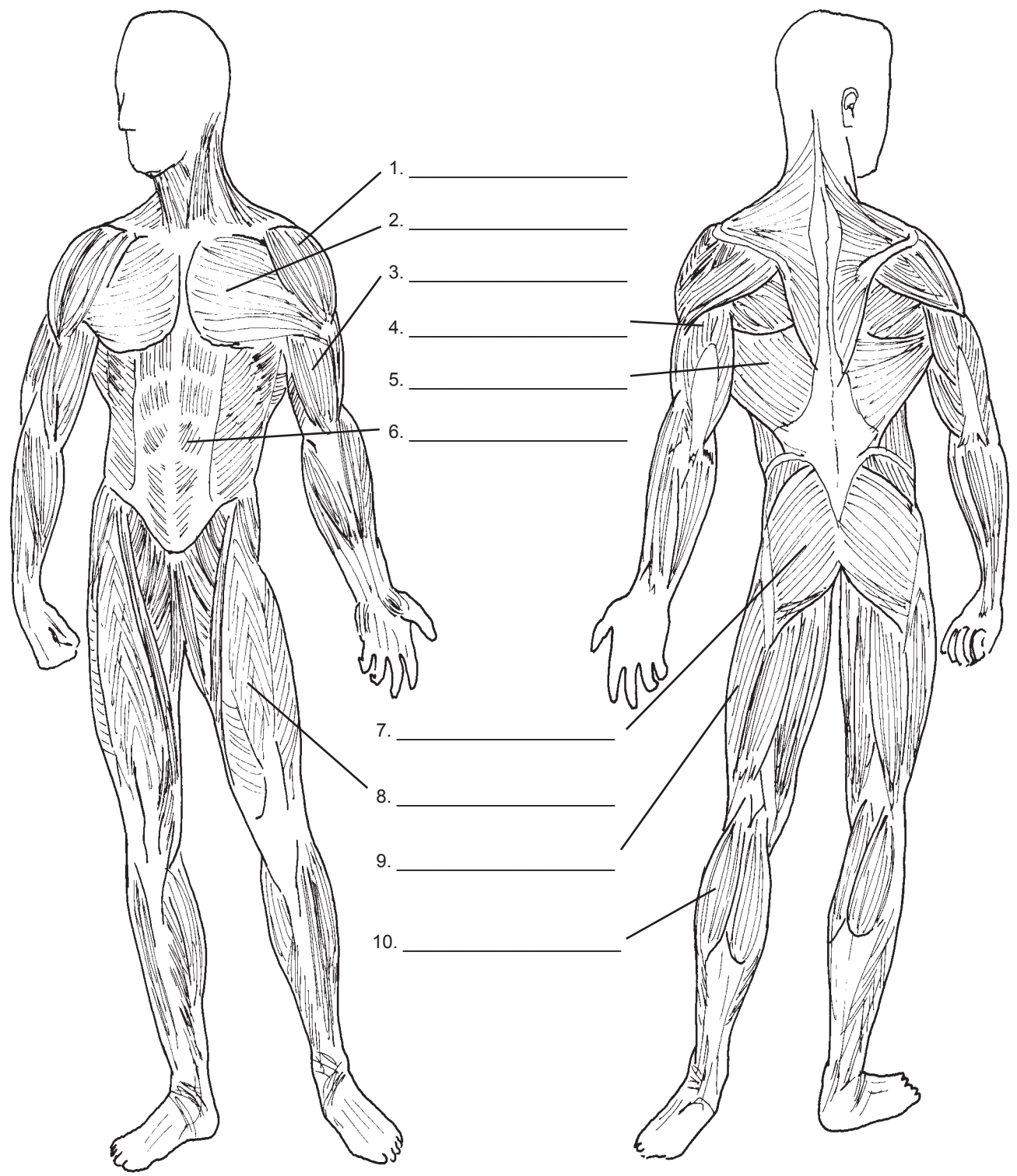


cardiac muscle tissue



skeletal muscle tissue

Activity 33.3
Muscles of the Body



Activity 33.3 (cont.)
Muscles of the Body

| Muscle | Function | Origin | Insertion |
|------------------|----------|--------|-----------|
| Gastrocnemius | | | |
| Rectus femoris | | | |
| Gluteus maximus | | | |
| Latissimus dorsi | | | |
| Biceps brachii | | | |
| Trapezius | | | |

| Action | Muscles Used |
|-----------------|--------------|
| smiling | |
| raising a glass | |
| kicking a ball | |
| climbing stairs | |