

Muscle Tissues and Skeletal Muscle Structure

Muscle tissues are characterized by the presence of elongated cells or muscle fibers that can contract. As they shorten, these fibers pull at their attached ends and cause body parts to move. The three types of muscle tissues are skeletal muscle, smooth muscle, and cardiac muscle.

A skeletal muscle represents an organ of the muscular system, and although it contains an abundance of skeletal muscle tissue, it also contains nerve tissue, blood, and various connective tissues.

Purpose of the Exercise

To review the characteristics of muscle tissues, to observe examples of the three types, and to review the structure of a skeletal muscle.

Learning Objectives

After completing this exercise, you should be able to:

1. Describe the general characteristics of muscle tissue.
2. Describe the special characteristics of each type of muscle tissue.
3. Identify examples of muscle tissues on prepared microscope slides.
4. Describe how connective tissue is associated with muscle tissue within a skeletal muscle.
5. Name and locate the major parts of a skeletal muscle fiber on a model.

Materials Needed:

compound microscope
prepared slides of muscle tissues (including skeletal, smooth, and cardiac muscle)
manikin
model of skeletal muscle fiber

For Demonstrations:

prepared slide of neuromuscular junction
fresh round beefsteak

Procedure A—Muscle Tissues

1. Review the section entitled “Muscle Tissues” in chapter 5 of the textbook.
2. Complete Part A of Laboratory Report 16 on page 92.
3. Use the microscope to observe each type of muscle tissue on the prepared slides. Look for the special features of each type, as described in the textbook.

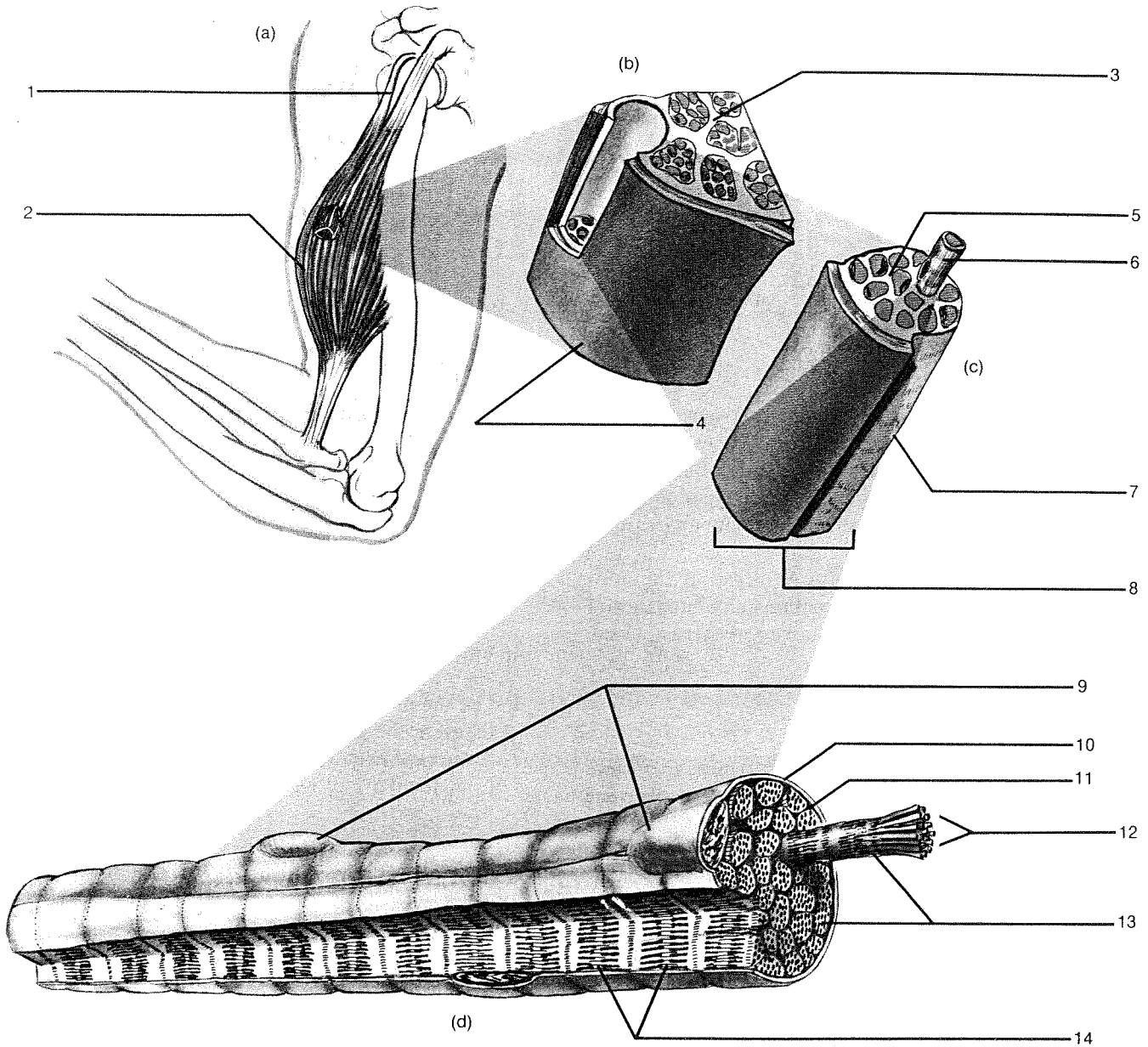
Demonstration

Observe the neuromuscular junction with the microscope set up by the laboratory instructor. This structure represents the union between a skeletal muscle fiber and a branch of a motor neuron. Usually such a muscle fiber will contract only when it is stimulated by the action of the motor neuron. When a nerve impulse from the brain or spinal cord reaches the end of the motor neuron fiber, the neuron releases a chemical substance (neurotransmitter) that, in turn, stimulates the muscle fiber to contract.

Procedure B—Muscle Structure

1. Review the section entitled “Structure of a Skeletal Muscle” in chapter 9 of the textbook.
2. As a review activity, label figures 16.1 and 16.2.
3. Examine the manikin and locate examples of fascia, tendons, and aponeuroses. Locate examples of tendons in your own body.
4. Complete Part D of Laboratory Report 16 on page 94.

Figure 16.1 Label the parts of a skeletal muscle shown in this illustration.



Demonstration

Examine the fresh beefsteak. It represents a cross section through the beef thigh muscles. Note the white lines of connective tissue that separate the individual skeletal muscles. Also note how the connective tissue extends into the structure of a muscle and separates it into small compartments of muscle tissue. Identify as many layers of fascia as you can.

- Examine the model of the skeletal muscle fiber and locate the following:

sarcolemma
 sarcoplasm
 myosin filament
 actin filament
 sarcomere
 sarcoplasmic reticulum
 transverse tubules

- Complete Part E of the laboratory report.

Muscle Tissues and Skeletal Muscle Structure

Part A

Complete the following statements:

1. Since skeletal muscles can be controlled by conscious effort, they are said to be _____.
2. The cross-markings on skeletal muscle fibers are called _____.
3. Cells of _____ muscle tissue have many nuclei.
4. The cells of muscle tissues also are called _____.
5. _____ muscle tissue is found in the walls of hollow internal organs.
6. Muscle tissue that cannot be controlled by conscious effort is called _____.
7. _____ muscle tissue is responsible for the movement of food through the digestive tube.
8. Intercalated disks are found between the cells of _____ muscle tissue.
9. The fibers of skeletal and _____ muscle tissue are striated.
10. _____ muscle tissue makes up the bulk of the heart.

Figure 16.2 Supply the labels for this illustration of a skeletal muscle fiber.

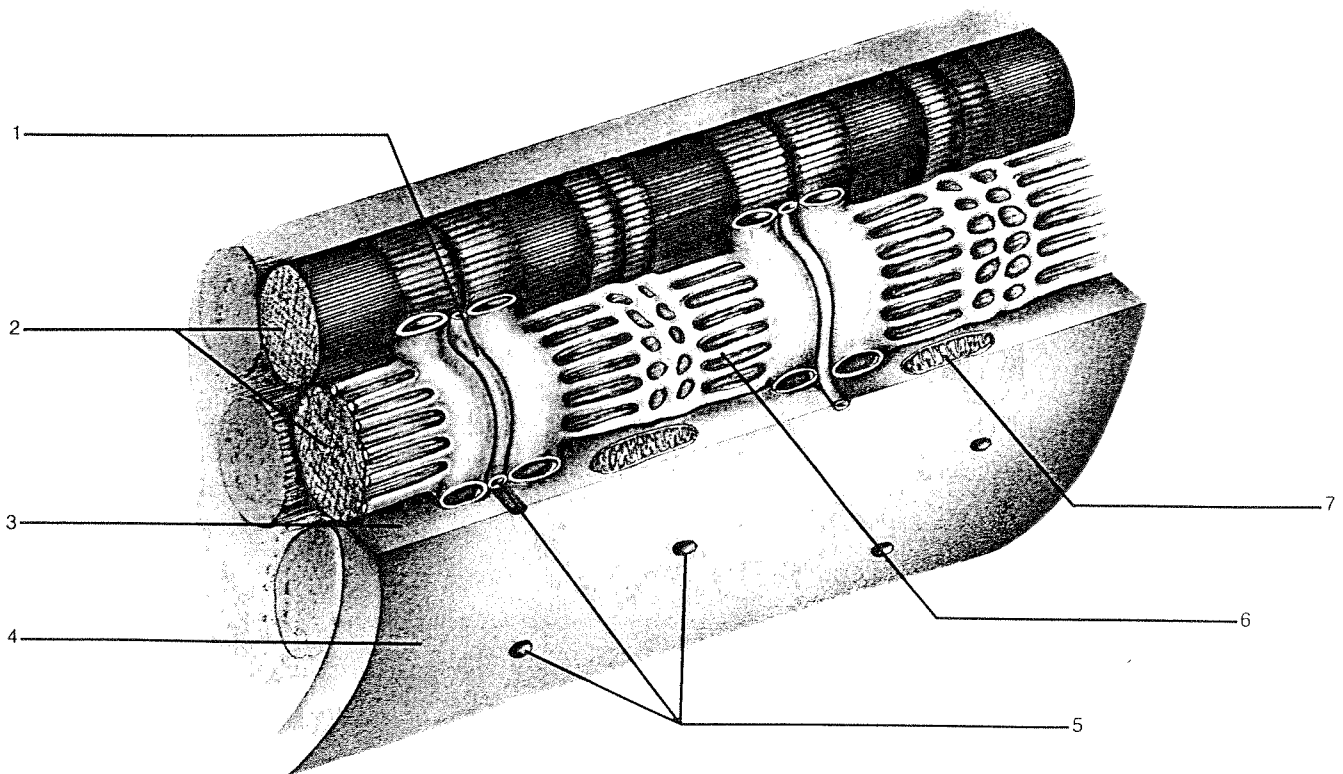
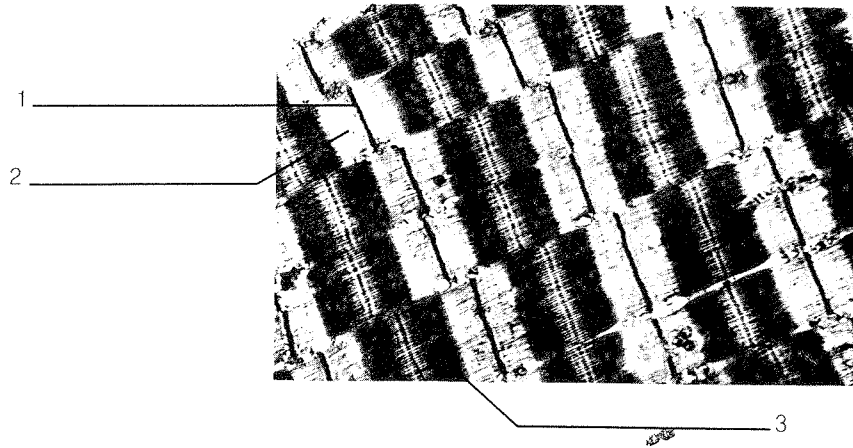


Figure 16.4 Identify the bands of the striations in this transmission electron micrograph of myofibrils.



Part D

Match the terms in Column A with the definitions in Column B. Place the letter of your choice in the space provided.

Column A	Column B
A. aponeuroses	___ 1. membranous channel extending inward from muscle fiber membrane
B. cisterna	___ 2. cytoplasm of a muscle fiber
C. fascia	___ 3. enlarged portion of sarcoplasmic reticulum on either side of a transverse tubule
D. myosin	___ 4. broad sheet of connective tissue that attaches coverings of adjacent tissues
E. sarcomere	___ 5. cell membrane of a muscle fiber
F. sarcolemma	___ 6. layer of connective tissue that surrounds a skeletal muscle
G. sarcoplasm	___ 7. unit of alternating light and dark striations
H. sarcoplasmic reticulum	___ 8. cellular organelle in muscle fiber corresponding to the endoplasmic reticulum
I. tendon	___ 9. cordlike part that attaches a muscle to a bone
J. transverse tubule	___ 10. protein found within a myofibril

Part E

Provide the labels for the electron micrograph in figure 16.4.

- 1. _____
- 2. _____
- 3. _____