

CHAPTER TEN

Content Review

1. The three connective tissue layers are the endomysium, the perimysium, and the epimysium. The endomysium is the innermost layer, and it surrounds each individual muscle fiber. This thin sheath of loose connective tissue and reticular fibers binds together the neighboring fibers and supports the capillaries that supply these fibers. The perimysium surrounds each fascicle. It is a layer of dense irregular connective tissue that supports and contains neurovascular bundles that branch to supply each individual fascicle. The epimysium is a layer of dense irregular connective tissue that surrounds the whole skeletal muscle. Often the epimysium integrates or blends with the deep fascia between adjacent muscles.
2. At the ends of a muscle, the connective tissue layers merge to form a fibrous tendon, which attaches a muscle to bone, skin, or another muscle. Tendons usually have a thick, cordlike structure. An aponeurosis also attaches a muscle to bone, skin, or another muscle. However, its structure is that of a thin, flattened sheet.
3. The A band is the dark band in a resting skeletal muscle fiber. It has both an H zone and an M line. The H zone is the lighter central region of the A band. The H zone is lighter in color because it contains only thick filaments. (Thin filaments are not present in the H zone when the muscle fiber is at rest.) In the center of the H zone is a structure called the M line, which is composed of proteins that serve as an attachment site for the thick filaments.
4. The thick filaments do not change shape. Myosin proteins in the thick filaments do not shorten. The I band becomes narrower as the thin filaments slide past the thick filaments. The sarcomere shortens as the Z discs move toward each other.
5.
 - a. A muscle impulse travels in the membrane of a transverse tubule.
 - b. Calcium ions are released from the terminal cisternae.
 - c. Calcium ions bind to troponin.
 - d. Tropomyosin molecules are moved off active sites on actin.
 - e. Myosin crossbridges bind to actin.
 - f. The myosin head pivots toward the center of the sarcomere.
 - g. Myosin heads bind ATP molecules and detach from actin.
6. A motor unit is composed of a single motor neuron and all the muscle fibers it controls. The movements of an eye require very precise control; therefore, each motor unit must be small. In contrast, much less precision of movement is needed in the postural muscles of the leg, so one motor neuron has many more fibers under its control than one motor neuron in the eye.
7. Atrophy is a reduction in muscle size, tone, and power that occurs when a skeletal muscle experiences markedly reduced stimulation. The muscle becomes flaccid, and its fibers decrease in size and become weaker. Causes of muscle atrophy include any situation or condition that causes a muscle to be used little or not at all, such as paralysis or wearing a cast. Hypertrophy, in contrast, is an increase in muscle fiber size. The repetitive, exhaustive stimulation of muscle fibers results in an increased number of mitochondria, larger glycogen reserves, and an improved ability to product ATP. Ultimately, each muscle fiber develops more myofibrils, and each myofibril

contains a larger number of myofilaments. Repeated stimulation of muscles to produce near-maximal tension, such as lifting weights, causes muscle hypertrophy.

8. Slow fibers contract more slowly than fast fibers, often taking two or three times as long to contract after stimulation. These fibers are specialized to continue contracting for extended periods of time. Therefore, an athlete who excels at sprinting would benefit from having more fast fibers than slow because sprinting is not a long-term aerobic activity. A successful sprinter would have more fast fibers due to the powerful contractions they produce with the help of their large number of sarcomeres.
9. Longus means “long.” Extensor indicates that the muscle causes an extension at a joint. Triceps muscles have three muscular head origins. Rectus means “straight.” Superficialis muscles are located at the body surface.
10. Intercalated discs are complex junctions where cardiac muscle fibers join together at their ends. Intercalated discs appear as thick, dark lines between cells in histologic sections. At these junctions, the sarcolemmas of adjacent cardiac muscle fibers interlock through desmosomes and gap junctions. Desmosomes hold the adjacent membranes together, and the gap junctions facilitate ion passage between cells. This free movement of ions allows each cell to transmit an electrical impulse and directly stimulate its neighbors.