

READING NOTES CHAPTER 9: MUSCULAR SYSTEM

Name _____
Period ____ Due date _____

Introduction (p. 293)

All movements – consciously-controlled or not – require the action of muscles. Muscular actions also provide muscle _____, propel body _____ and _____, generate the _____, and distribute _____. As we learned in the histology chapter, there are 3 types of muscle tissue: _____, _____, and _____.

Be sure to read the inset box regarding the muscular movements behind texting on page 293!

Skeletal muscle structures and coverings (p. 293 – 295)

Provide a definition/description for each of the structures listed below:

Fascia

Epimysium

Perimysium

Endomysium

Fascicle

Muscle fiber

Sarcolemma/sarcoplasmic membrane

Sarcoplasmic reticulum

Myofibril

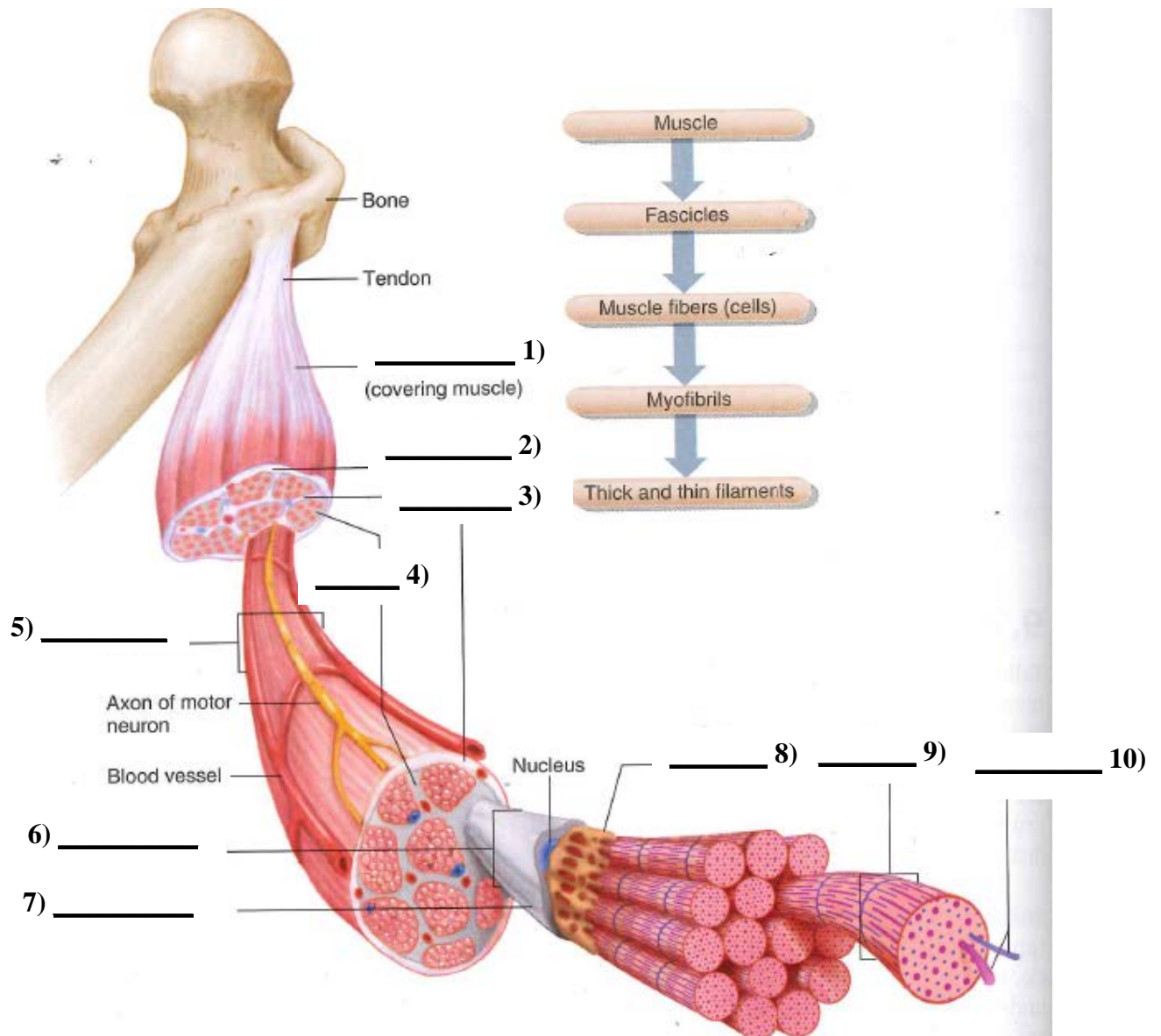
Myofilaments

Actin

Myosin

Skeletal muscle structure and coverings (p. 293 – 294)

Label the structures on the below diagram:



A **sarcomere** is defined as the most basic, fundamental structure of a skeletal muscle. What this means is that what has to happen for a muscle to contract has to happen at this level. Define/describe each of the following structures of the sarcomere:

I Band:

Z Line:

A Band:

M Line:

H Zone:

Thick Filament:

Thin Filament:

Skeletal Muscle Contraction and Relaxation (pages 297 – 301)

In order for skeletal muscles to contract, everything must occur in a chain reaction. Since skeletal muscles are voluntary in control, it all starts with a nervous signal being sent from the brain. The electrical stimulus travels down the neuron and causes the release of calcium. The calcium then in turn causes the synthesis and release of _____ the neurotransmitter that motor neurons use to control skeletal muscle contraction. It then _____ rapidly across the synapse and binds to receptors in the muscle fiber _____. This causes an ion imbalance which in turn triggers the sarcoplasmic reticulum to release _____ ions. These ions diffuse out of the reticulum and then bind to _____, changing its shape. This change causes the movement of _____ molecules to expose _____ sites on the _____ filaments. This allows links to form between _____ heads and actin, forming _____ - _____. ATP then gets broken down, putting the myosin head in a _____ position – known as a **power stroke**. Another ATP molecule binds, _____ the myosin head from the binding site – known as a **recovery stroke**. Since tropomyosin has its active site still exposed, this process will repeat until the sarcomere is fully contracted.

To relax the muscle, we have to undo the entire process from the beginning. The nervous stimulation must first stop. Then an enzyme called _____ breaks down acetylcholine that is in the synapse. This then causes the sarcolemma to release **calsequestrine**, which pulls calcium ions off the troponin and brings them back into the _____. This causes the troponin to shift again, covering up the active sites and prevents the myosin heads from forming a _____ - _____. The sarcomere is now able to relax.

Energy sources for contraction (pages 302 – 304)

It is important to remember that ATP is the energy used to contract muscles. However, a muscle fiber has only enough ATP to contract briefly and must regenerate ATP. To do this, the initial source of energy to regenerate ATP is _____. In order to provide us with enough ATP to survive, oxygen is required. This process is called _____ reactions of cellular respiration. When we use muscles more strenuously, our system can't keep up and _____ reactions break glucose into pyruvic acid which will become _____ acid in animals. As this acid accumulates, a person develops an _____ debt that must be repaid at a later time. This means that the oxygen must be used by liver cells to turn the acid into _____ and to resynthesize and restore ATP amounts to their original concentrations.

Muscles that are exercised persistently may lose their ability to contract, called _____. How quickly this happens depends on how often an individual exercises, but it is also due to the muscle type. **Fast-twitch, slow-twitch, and intermediate** fibers process oxygen differently, enabling one to endure exertion at different levels.

Muscular responses and types of contractions (pages 304 – 307)

For one muscle fiber to contract, a certain strength of stimulation called _____ **stimulus** must be present. The contractile response (leading up to contraction and continuing through relaxation phases) is called a _____. This has a brief delay, called the _____ period, that may be less than _____ milliseconds. The force that a muscle fiber can generate is not limited to the force of a single twitch, however. The stimulus can increase in frequency, causing the muscle to contract more frequently and more strongly. This is called a **treppe**. The stimulus can also occur more quickly to a point when the fiber is unable to completely _____ before the next stimulus in the series arrives. This is called a _____ contraction, or **wave summation (also called incomplete tetanus)**. As the stimulus occurs even more frequently, the time the muscle lacks even partial relaxation, a state called _____ contraction, or **complete tetanus**.

Muscles contract in two different ways. One way is when the muscle moves as it contracts, called _____. As it moves, the muscle can either shorten, called _____, or lengthen, called _____ contraction. Another way the muscle may contract is by increasing tension but remaining the same length. Contractions of this type are called _____.