Jonathan Quang 3/6/15

HW #13 SLS44-09/Period 4,5

1. Muscle contraction begins when the muscle receives a signal from a nerve cell in the form of acetylcholine. This depolarizes the membrane of the muscle cell. The signal is conducted to within the cell via transport tubules. The calcium ions in the sarcoplasmic reticulum are released in response. The calcium ions clear the binding site on the thin actin filament by moving away the tropomyosin and troponin. This allows for the thick myosin filament to form a cross bridge with the thin filament. When ATP bids with the thick filament, it allows for the thick filament to be "cocked" (i.e. moving to a position with higher potential energy). Upon releasing the ATP as ADP and an inorganic phosphate, the thick filament pulls the thin filament closer to the center of the sarcomere, shortening the muscle fiber. When the muscle fiber is no longer depolarized, the sarcoplasmic reticulum begins reabsorbing calcium ions, allowing for the binding sites on the thin filaments to be blocked. This relaxes the muscle fiber.

2. The three function classifications of joints are synarthrosis, amphiarthrosis, and diarthrosis. They classify synarthrosis immovable joints, slightly movable joints, and freely movable joints respectively. The structure of these joints are fibrous, cartilage, and synovial joints. The two characteristics that make synovial joints unique are that there is fluid within the joint that assists with shock absorption and lubrication and that the joints are covered by an atricular capsule that is continuous with the periosteum of articulating bones. The hip joint is stronger than the shoulder joint because the hip joint must bear the weight of the torso, arms, and head above it while a human is standing.

3.Muscle cell anatomy is unique for various reasons. One reason is that the plasma membranes have pores that tunnel into the cell called transport tubules. Another reason is that muscle cells have more than one nucleus. In addition, muscle cells have more mitchondria (called sarcosomes) than other cells to provide the ATP necessary for contraction. Also, muscle cells contain myofibrils with sarcoplasmic reticulums surrounding them. Other than the sarcoplasmic reticulum and myofibrils, organelles tend to be scattered around the cell.

4. There are at least three problems that could disrupt muscle cell contraction. One problem is when the sarcromeres do not contract in unison. If some sarcromeres contract while others do not, then the sarcromeres can tear. Another problem occurs when there is not enough ATP. If there is not enough ATP, then thick filaments cannot pull thin filaments to the center of the sarcomere. A third problem would be a lack of calcium. If there is not enough calcium ions for the sarcoplsmic reticulum to release, then the binding site on the thin filament will not be exposed.

5. The difference between osteoporosis and osteoarthritis is that osteoporosis is a bone disease in which the amount of bone and its quality have been reduced, while osteoarthritis is a degeneration of the protective cartilage at the end of bones. In addition, the effects of osteoporosis are less noticeable than osteoarthritis since osteoporosis only makes bones prone to injury. Osteoarthritis will eventually produce pain and inflammation at a joint.

Bibliography

Osteoporosis and Osteoarthritis. (n.d.). Retrieved March 8, 2015, from http://www.osteoporosis.ca/osteoporosis-and-you/osteoporosis-and-osteoarthritis/

Audesirk, T., & Audesirk, G. (1999). Action and Support: The Muscles and Skeletons. In Biology Life on Earth (5th ed., pp. 693-707). Upper Saddle River: Prentice Hall.